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Analysis of determinants of training performance, retention, and promotion to Lieutenant Commander of Naval Flight Officers

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THESIS

ANALYSIS OF DETERMINANTS OF TRAINING PERFORMANCE, RETENTION, AND PROMOTION TO LIEUTENANT COMMANDER OF NAVAL FLIGHT OFFICERS

by

Billy K. Fagan

June 2002

Thesis Co-Advisors: William R. Bowman
Stephen L. Mehay

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The purpose of this research is to examine the cohort of Naval Flight Officers (NFOs) commissioned from 1983 to 1990 and analyze the determinants of successful career progression, as measured by patterns of training performance, retention, and promotion. Training performance is defined as NFOs successfully earning their "wings of gold." Retention is defined as remaining in the service beyond the minimum service requirements to the Lieutenant Commander (LCDR/O-4) screening. Promotion is defined as being selected for LCDR. Determinants examined include source of commission, demographics (ethnicity, gender, and age), profile of academic institution, undergraduate and graduate education, time to train, and community platform.

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ANALYSIS OF DETERMINANTS OF TRAINING PERFORMANCE, RETENTION, AND PROMOTION TO LIEUTENANT COMMANDER OF NAVAL FLIGHT OFFICERS

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Submitted in partial fulfillment of the
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ABSTRACT

The purpose of this research is to examine the cohort of Naval Flight Officers (NFOs) commissioned from 1983 to 1990 and analyze the determinants of successful career progression, as measured by patterns of training performance, retention, and promotion. Training performance is defined as NFOs successfully earning their "wings of gold." Retention is defined as remaining in the service beyond the minimum service requirements to the Lieutenant Commander (LCDR/O-4) screening. Promotion is defined as being selected for LCDR. Determinants examined include source of commission, demographics (ethnicity, gender, and age), profile of academic institution, undergraduate and graduate education, time to train, and community platform.

This study finds that the amount of training time NFOs require to earn their wings reflect their overall performance. This is evident for those who remain to the LCDR promotion board and actually promote. The longer it takes a NFO to earn wings following commissioning, the less likely the NFO will promote. Because training time is a significant factor, successfully completing flight school is key for long-term success as a NFO. Regarding success in flight school, both NROTC and OCS graduates have a more difficult time completing flight school than USNA graduates. Overall, the success of USNA graduates could be attributed to both the initial admissions screening process and the training received over four years at USNA.

Additional noteworthy results include the following. African-Americans are less likely to earn their wings. NROTC graduates are the least likely to promote to LCDR. Being married with children increases the probability of retention, and being married with or without children increases the probability of promotion. The older the NFO is at the time of commissioning, less likely they are to earn their wings, more likely to retain, and less likely to promote.

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I. INTRODUCTION

Promotion of capable officers is an important aspect of every officer community. However, to have a superior pool of officers from which to select from, a significant percentage of those who enter the U.S. Navy should remain in the service to the Lieutenant Commander (LCDR) screening point at 10 years of service (YOS). For Naval Flight Officers (NFO), retention is a critical problem, because projected needs exceed both current accessions and the expected number of retained NFOs.

Although retention is a problem, retaining quality officers is also a concern. One way to determine if quality officers are being retained is to examine a group at the entry level and monitor their progress within a community. For example, NFOs training performance can be examined as a measure to indicate retention and promotion of high quality officers.

This study explores the determinants evident in the training, retention, and promotion of NFOs commissioned between 1983 and 1990, to provide information that will aid in the recruiting and retention of high quality NFOs. Results and recommendations are provided in conclusion.

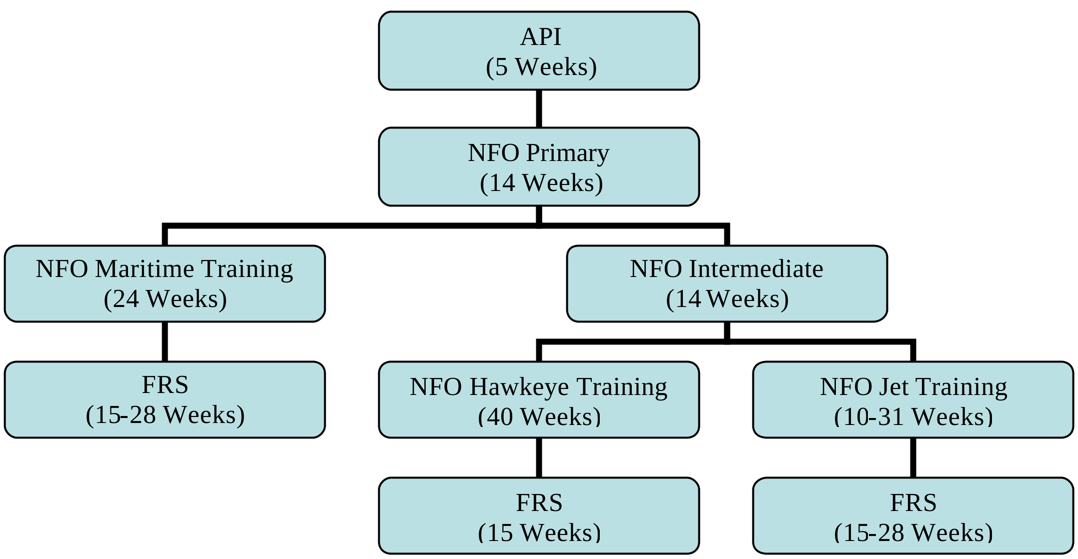
A. BACKGROUND

NFOs are responsible for navigation and weapons system implementation for their community platforms on which they currently serve, including C-130, E-2, E-6, EA-6B, EP-3, F-14, F/A-18, P-3, and S-3. Before NFOs reach their respective platforms, they must complete flight school and earn their wings. Until NFOs earn their wings, they are student NFOs (SNFOs). The time required to earn their “wings of gold” will vary depending on the platform the SNFO will join. Undergraduate training requires approximately 43 weeks (10 months) of training for maritime aviation (C-130, E-6, EP-3, and P-3), 43 to 64 weeks (10 to 15 months) of training for jet aviation (EA-6B, F-14, F/A-18, S-3), and 73 weeks (17 months) of training for Hawkeye (E-2). Upon earning their “wings,” NFOs serve an initial minimum service requirement (MSR) of 6 years regardless of platform or training length. Additional training will be required within the

NFOs respective community prior to deploying operationally. The amount of additional training will vary with platform type; therefore, the required time will also vary. Typically, NFOs will reach their operational squadron 18-24 months after their initial training commenced.

SNFOs attend flight school at Naval Aviation Schools Command in Pensacola, Florida (Figure 1 provides a diagram of the training pipelines.) The first training program is Aviation Preflight Indoctrination (API) that lasts 5 weeks. The next step is Primary Flight Training (Primary) with NFO primary training squadrons (i.e. VT-4 or VT-10), which lasts 14 weeks. Upon completion of Primary, about half of the students proceed to Randolph Air Force Base in San Antonio, Texas to complete a 24-week course in advance navigation for maritime aviation with the 562nd Flying Training Squadron. Graduates of this course earn their wings.

Figure 1. NFO Flight Training Pipeline



Source: Naval Aviation Schools Command's API Handout.

The remaining half of SNFOs in Pensacola continues intermediate training with VT-4 or VT-10 for 14 weeks. At the end of this intermediate training, a few SNFOs (typically 1 or 2 per class) will select or be selected to go to VAW-120 in Norfolk, Virginia for an additional 40 weeks of Hawkeye training. Graduates of this course earn their wings. The remaining SNFOs in Pensacola will transfer to VT-86 for 10-31 weeks of jet aviation training. Graduates of this course earn their wings.

After earning their wings, all NFOs will receive additional training within their respective communities at fleet readiness squadrons (FRS). At this time, the 6-year initial MSR begins counting down.[1] NFOs will reach their operational squadron 4-7 months following their training at the FRS. Typically, the first sea tour for an aviator will be a 36-month tour of duty. The first shore tour will be 30 months in duration for most officers. Additional time will be spent moving between duty stations plus leave (vacation time) used en route. Thus, an additional two months of MSR will be used since the countdown began prior to a NFO's first shore assignment.

NFOs that complete both their first sea and shore tours will have satisfied the 6-year initial MSR for an approximate total of 7 to 8 years of active duty naval service. At this point, NFOs have the opportunity to elect to resign from active duty service prior to returning to participate in a disassociated-sea duty, a non-flying deployable billet on a ship.

B. PURPOSE

This study will identify trends in training, retention, and promotion of NFOs commissioned between 1983 and 1990. This study will provide information to assist the U.S. Navy in managing recruitment and retention efforts and in ensuring that a large pool of personnel is available at the LCDR promotion point.

[1] MSR is the amount of time that the officer is obligated to serve. On Officer Data Card, a data block shows the number of months remaining of MSR. This block continually decreases unless additional obligation is incurred, hence the phrase, "counting down."

C. RESEARCH QUESTIONS AND METHODOLOGY

1. Research Questions

The primary goal of this thesis is to examine the factors that predict whether individuals completed training, retained until the LCDR promotion board, and then promoted to LCDR. To aid this examination, the undergraduate educational background and the time required to earn wings are used as indicators of a higher quality naval officer. A higher quality officer is defined as one who is more likely to be promoted to LCDR at the O-4 promotion board. A secondary goal is to determine the effects of lateral transfers within the NFO community.

Other questions investigated include: How does an NFO platform selection affect retention and LCDR promotion? Are higher quality commissioned officers more likely to remain as NFOs? Do SNFOs who attrite remain and promote as well as NFOs? Do NFOs that laterally transfer out promote as well as NFOs that remain within the community?

2. Methodology

First, literature written about naval aviation retention, military personnel retention, and additional NFO studies are reviewed. Following this review, personal demographics and characteristics of NFOs are compared to the entire naval officer corps. Next, statistical models to evaluate the quality of NFOs that earn their wings, remain, and promote to LCDR are developed from the results of the two previous steps. These, statistical models include an observed metric from the data to be applied within the models as appropriate. Using the models, the data set of NFOs from year groups (YG) 1983 to 1990 are examined and analyzed to address the research questions posed above. Finally, conclusions and recommendations are provided.

D. SCOPE AND LIMITATIONS:

The scope of this thesis includes: (1) a review of literature on naval aviation officer retention and military personnel retention; (2) a review and comparison of demographic characteristics of naval officers and NFOs; (3) a review of Barron's rating

of undergraduate colleges; (4) a review of NFO aircraft compositions; (5) a review of lateral transfers; and (6) an estimation of statistical training completion, retention and promotion models using data for NFOs from YG 1983 to 1990.

One limitation is that this thesis covers only YG 1983 to 1990. For example, an officer commissioned in 1983 would not reach MSR until approximately 7.5 to 8 years, or approximately 1990 to 1991. Following Operation Desert Storm in 1991, the military went through a significant drawdown (approximately 30 percent reduction in force levels) until reaching its steady state force levels of 13,000 naval aviation officers.[2] To reach this level, the U.S. Navy decommissioned more than 70 squadrons, removing over 600 aircraft from the inventory. (Scorby and Johnston, 2001)

During this same period, the U.S. Navy offered many officers early retirement or the opportunity to leave the service regardless of the amount of remaining obligated service time. The remaining officers would work in an environment characterized by a lower quality of service. The operational tempo increased but fewer personnel and aircraft were available to share the burden of work. The net effect was that naval officers spent more time away from their families while working with degraded equipment. These factors are not included in the data set; however, they help describe the organizational climate under which the officers within the data set operated.

Another environmental factor to consider is that retention bonuses currently available to NFOs were not available to a majority of the officers in the data set. Aviation Career Continuation Pay (ACCP) did not go into effect until fiscal year (FY) 2000. ACCP provides a bonus to all eligible NFOs regardless of community. Previously, the U.S. Navy only paid Aviation Continuation Pay (ACP) bonuses to members of a specific community on a first-come first-serve basis until the "expected" target levels were attained. Due to shortages in the jet community, most ACP bonuses were offered to jet pilots. Although other pilots also received ACP, it was normally at lower amounts. NFOs rarely had the opportunity to receive ACP. Other pilots and NFOs perceived ACP as an unfair bonus, which decreased retention within those communities. This perception prompted the change to ACCP. (Moore and Griffis, 1999) Thus, NFOs

[2] Naval aviation officers include both pilots and NFOs.

commissioned in 1990 would potentially be the only group within the data set whose retention decision could have been influenced by the ACCP bonus opportunity.

E. ORGANIZATION OF STUDY

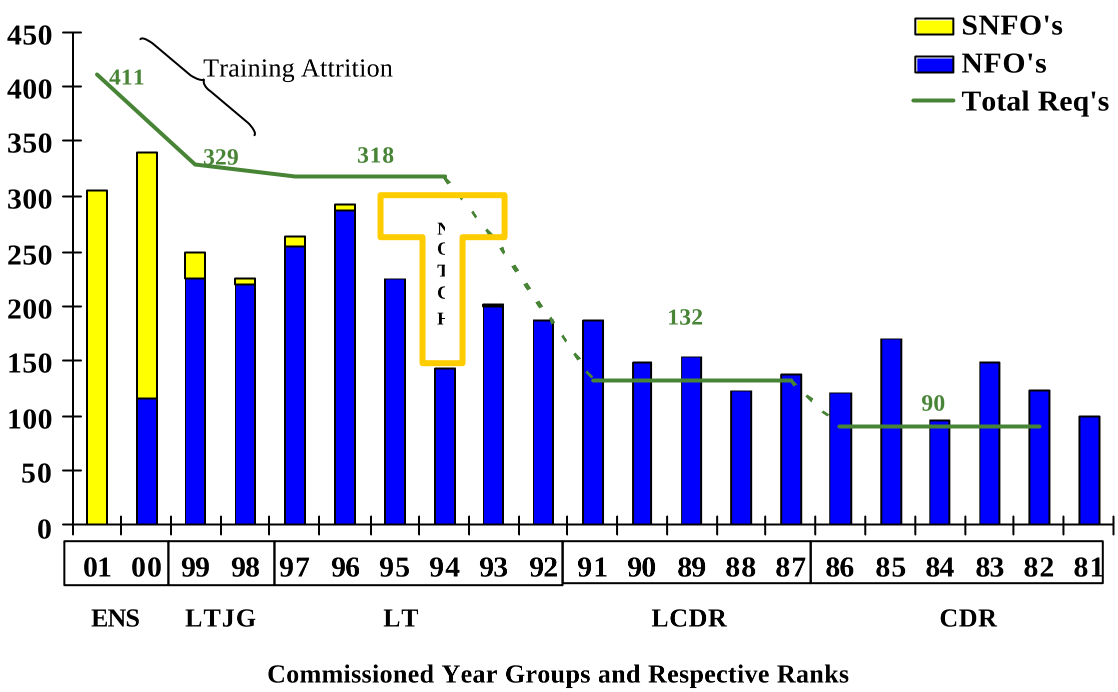
This study is organized in six chapters. Chapter I introduce the basic elements of the NFO community and the reason for the study. Chapter II reviews the current state of the NFO community, previous research regarding naval aviation retention, other retention models, and additional NFO specific studies. Chapter III describes the data and compares NFOs to other naval officers. Chapter IV specifies NFO time to train metrics and retention and promotion models. Chapter V describes the results of statistical models discussed in Chapter IV and Chapter VI contains conclusions and future research recommendations.

II. LITERATURE REVIEW

A. STATUS OF THE NAVAL FLIGHT OFFICER COMMUNITY

A recent brief by CDR Jack Scorby and CDR Jay Johnston, Naval Aviation Community Managers, to CAPT Robertson on 18 October 2001 on the status of naval aviation identified numerous key points regarding the direction of naval aviation retention. Naval aviation comprises 50 percent of the Unrestricted Line Officers (URL) and 24 percent of the entire naval officer corps. Currently, 23 percent of naval aviation students will attrite during their training between API and FRS thus requiring 878 student pilots and 411 SNFOs to meet annual requirements for 680 pilots and 329 NFOs. (Scorby and Johnston, 2001)

Figure 2. NFO Year Group Inventory



Source: Scorby, et. al

Figure 2 shows the SNFO, NFOs and personnel shortages as it pertains to NFOs from YG 1981 to 2001. The gray and black stacked bar graph displays the actual number of SNFOs and NFOs, respectively. The solid line that is primarily above the bar graphs represents the annual requirements. As previously mentioned, SNFOs are required to enter the training pipeline to reach the U.S. Navy's goal of 329 NFOs. This annual requirement will decrease approximately three percent to 318 until the LCDR promotion boards, which has an annual requirement of 132 NFO LCDRs. The "T-Notch" in the graph above YG 1993 to 1995 depicts the decrease in the accession pipeline that is slowly moving from left to right each year. This represents a severe retention problem. Currently 100 percent of YG 1994 will need to be retained to meet the LCDR department head (DH) billets.

Although "T-Notch" is an immediate concern of retention, it is merely symptomatic of the larger problem of not meeting accession requirements. From YG 1993 to present, the bars fall below the line, which demonstrates two trends. First, the accession requirements are not being met, which results in increased retention requirements. Second, this shortage of personnel does not correspond to reduced U.S. Navy requirements. Thus, 1,328 NFOs from YG 1993 to 1998 have been working harder to fulfill requirements intended for 1,908 NFOs (an overall shortage of 30 percent (1,328/1,908 = 69.6 percent)). (Scorby, et. al.) Increased workload hinders current retention efforts by affecting environmental factors that influence retention decisions.

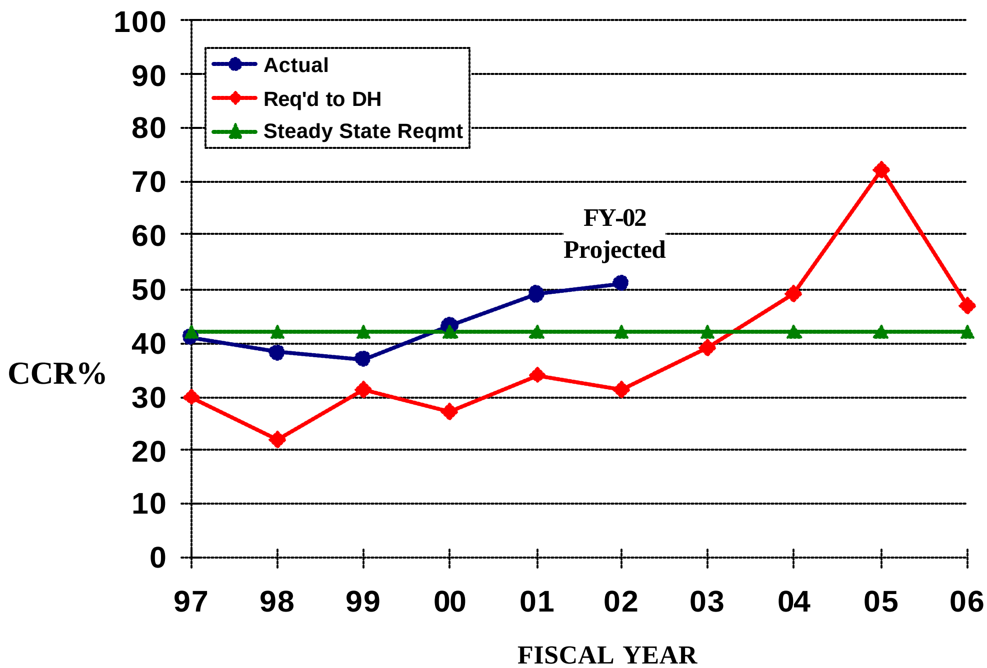
The Department of Defense (DoD) measures retention by Cumulative Continuation Rates (CCR). CCR is the propensity of an aviator in his or her seventh year to remain on active duty at the end of their 12th year, or approximately the middle of their DH tour.

In Figure 3, CCR, the horizontal line with triangles indicates the steady state requirement percentage for NFOs to remain to the LCDR promotion board, which in the case of naval aviation is 41 percent. The line with circles shows actual retention rates, while the line with diamonds shows the CCR percentages the U.S. Navy needs to meet DH requirements. Ideally, the line representing actual retention rates should be above the line representing DH requirements. NFOs are meeting goals, whereas pilots are falling

short. The net result is that, there are just enough naval aviation officers available to fill all the DH billets. (Scorby, et. al)

Implementation of ACCP has had a positive effect on the retention of NFOs. In FY00, NFO CCR increased by six percent. By FY05, Figure 3 shows that a CCR of 72 percent will be required to meet DH requirements. This conclusion corresponds to the previous discussion regarding Figure 2 and the associated problems with "T-Notch." (Scorby, et. al)

Figure 3. NFO Retention: Cumulative Continuation Rates (CCR)

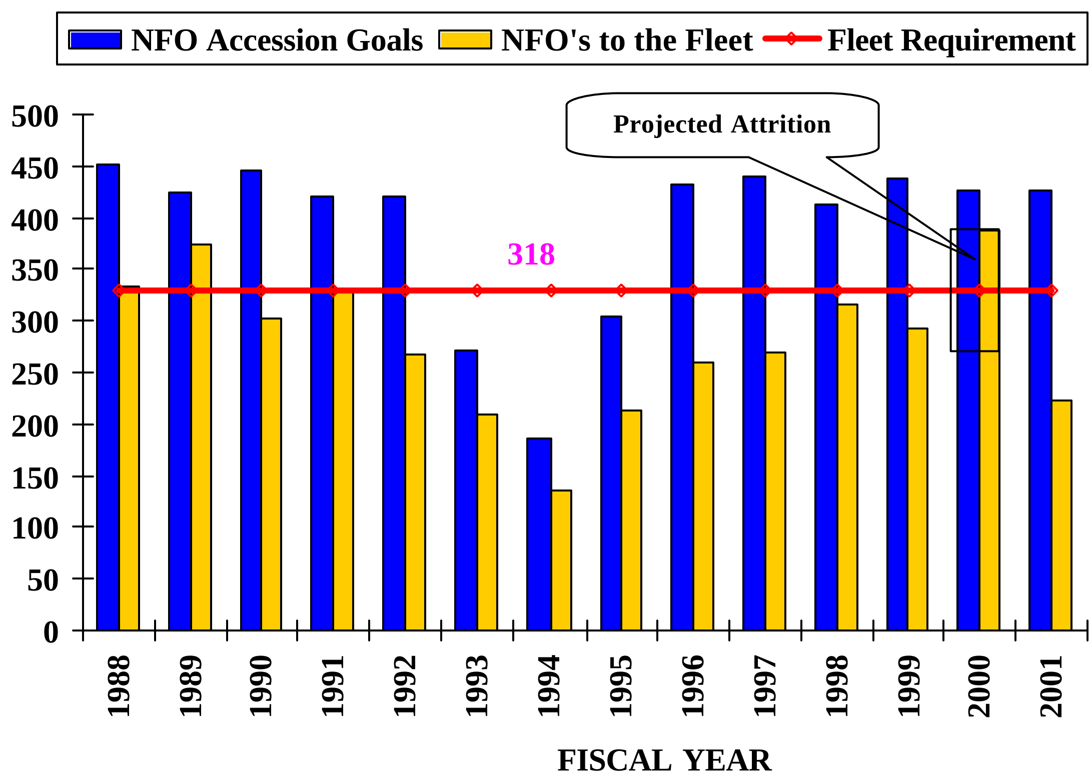


Source: Scorby, et. al

Currently, NFOs are meeting retention levels required to fill DH billets. However, there is a woeful shortfall in the accession pipeline. In FY90, a 30 percent reduction in naval aviation personnel was mandated, resulting in today's steady-state level of 13,000. To achieve this reduction, a 48 percent decrease in accessions from 1993 to 1995 occurred, primarily from Officer Candidate School (OCS).

Figure 4 incorporates from Figure 2 the fleet requirement of 318 and projected attrition of 23 percent as it pertained to the actual accessions as compared to the goals. Essentially, this decreased intake will require an increase in retention to provide a sufficient selection pool of officers to promote to meet naval aviation's DH requirements. (Scorby, et. al)

Figure 4. NFO Accessions



Source: Scorby, et. al

B. FACTORS AFFECTING NAVAL AVIATION RETENTION

Numerous studies have examined the various trends affecting naval aviation retention. These studies have examined personal demographics, financial influences, and quality of work. The methodologies used in these studies varied in scope and approach. The data used in these studies also varied. A review of these studies provides a better understanding of the retention problem.

The first study reviewed is that of Riebel (1996). Riebel used an annualized cost of leaving (ACOL) model to predict retention decisions based on the financial effects of aviation career incentive pay[3] (ACIP) and aviation continuation pay[4] (ACP). Data from the Defense Manpower Data Center's (DMDC) Officer Master File (OMF) and Turner's (1995) study on individual characteristics were used to build a model to compute present value of expected future earnings. The data set was reduced to 15,832 observations after removing those that were not "at risk" of separating. This included those still learning to fly and those that already passed the 20 YOS milestone.

ACOL is an econometric model developed by Warner and Goldberg (1987) to predict whether a military service member will decide to remain on active duty. ACOL evaluates a decision on the premise of a cost-benefit analysis relative to 20 YOS. A logit regression model incorporated future expected civilian and military earnings to assess the effect on ACOL from increases in ACIP or ACP.

The results of Riebel's study showed that retention is improved by increasing the bonus. A $50 increase in ACIP will increase predicted aviator retention by .209 percent. A $100 increase in ACIP will increase predicted aviator retention by .435 percent. Doubling ACP will increase retention by .625 percent. Riebel recommends increasing ACP because it is more targeted and would affect those communities requiring significant

[3] ACIP is the monthly flight pay to all Naval Aviation officers regardless of deployment or tour status and is based upon number of years having flown for the U.S. Navy.

[4] ACP was found to be less effective than initially desired with the consequential side effects to other aviation communities that did not receive an ACP bonus. (Moore and Griffis 1999). The U.S. Navy replaced ACP with ACCP in fiscal year 2000. ACCP currently offers pilots and NFOs $25,000 and $15,000 bonuses respectively per year for either a 3-year or a 5-year contract following MSR. (NAVA DMIN 003/02)

retention, whereas ACIP would increase retention in those communities that have no requirement for increased retention. (Riebel)

The next study examined is that of Sullivan (1998). Sullivan developed a retention survey to quantify U.S. Navy and U.S. Marine Corps pilot attitudes towards job satisfaction and turnover intent. Previous research indicates that job satisfaction is one of the most reliable predictors of retention. Classification and regression tree (CART) and logistic regression were the analytical tools applied to the data collected from the designed instrument. Sullivan designed the instrument after the U.S. Navy's retention survey incorporating slight modifications to develop the best possible data. The population of the study included 1,669 (1,203 U.S. Navy, 466 U.S. Marine Corps) pilots from East and West Coast squadrons not deployed and not involved in the training command pipeline. In addition, the study omitted pilots on shore duty. (Sullivan)

Job satisfaction was defined as how well that person (1) satisfied the basic requirement of the job, and (2) was satisfied by the job as the "Theory of Work Adjustment" states. (Zytowski, 1973) According to this study, job satisfaction seemed to be a more accurate indicator of whether an employee would voluntarily quit. Job satisfaction research has noted the significance of personal demographic characteristics on job satisfaction. However, Sullivan noted that one study showed job satisfaction for both men and women varied two to three percent directly relative to differences in age. Within Sullivan's study, dissatisfied officers intended to leave the service.

By applying CART, Sullivan split the data into the maximum deviance possible for the dependent measures at each successive branch within the tree. The eventual tree model is classified as intending to leave (value=1) or not intending to leave (value=0). The basis of this CART model was derived from Venables and Ripley (1994). U.S. Navy pilots (n=1203) classified via CART consisted of 18 variables in the construction and 25 terminal nodes. The model omitted 574 data points due to the omission of values provided within the instrument and misclassified at 14.6 percent. (Sullivan)

A logistic regression model was used as a better tool to analyze the data as the "NA" values reduce the effectiveness of the CART. S-Plus (version 4.5) software was used to estimate this model. The methodology included the backwards-forwards deletion

of non-significant independent variables from the model until there was no further improvement to the Akike Information Criterion (AIC). AIC accounted for deviance as associated with each successive model by looping three times with a random sampling of two-thirds of the data and predicting on the remaining one-third. The resulting model predicted for U.S. Navy pilots with an 11 percent improvement over random guessing. The model's accuracy improved over 15 percent when predicting only those leaving. (Sullivan, 1998)

The third study of naval aviation retention reviewed is that of Poindexter (1998). Poindexter recommends that the U.S. Navy replace the current method of extrapolating historical trends with two alternative statistical methods: logistic regression and classification trees. Poindexter recommends this for two reasons. First, these two techniques provide significantly more accurate forecasts than the current method. Second, these techniques can identify significant independent variables affecting aviation retention.

The population of Poindexter's study included 13,310 naval aviation officers who served between 1990 and 1996 in the pay grade of O-3, O-4, and O-5 (LT, LCDR, and CDR, respectively). Poindexter randomly divided the data set in two equal parts with the first half for the model construction and the latter half for the test and evaluation of the model. The study found accession source, geographic relocation of an aviator's duty station, assignment to non-flying billets, and grade to be significant factors influencing aviation retention. (Poindexter, 1998)

Keegan (1999) explored factors influencing the career decisions of female aviation officers in sea-going aviation communities. Keegan interviewed 21 pilots and NFOs from various sea-going aviation communities. Nineteen of 21 women surveyed planned to leave the U.S. Navy following their MSR with no recourse for the U.S. Navy to use to entice them to remain. The primary reasons cited included the desire to start and have a family and the lack of positive female role models within the aviation community.

A chapter of Keegan's study covered the history of women's role in the military. In 1973, the first female naval aviator earned her "wings of gold." Over the years, uniformed women performed duties closer and closer to the front lines. For example, 170

women served on air transport crews during the 1983 invasion of Grenada and in Operation Desert Storm in 1990-1991. This led to the 1992-1993 Kennedy-Roth Amendment, which repealed provisions of U.S.C. Title 10 that prohibited women from flying aircraft in combat missions. In 1993, the Honorable Les Aspin, Secretary of Defense, ordered all services to open combat aviation to women. (Ebbert and Hall, 1994)

As of 1999, females make up 14 percent of U.S. Navy personnel, 49,110 active duty personnel consisting of 7,801 officers and 41,309 enlisted personnel (Women's Research and Education Institute, 1998). Historically, the number of female pilots and NFOs has been less than the 14 percent U.S. Navy average. This historic information may help explain the absence of positive female role models for junior female officers.

In the fifth study reviewed, Mills (1999) used Riebel's ACOL model to evaluate the proposed ACCP that replaced the ACP. However, Mills examined the ACOL beyond 20 YOS. Mills' model incorporated YOS decisions points (9, 11, 16, and 21 years) that correspond with the financial incentives used to help retain aviation officers to retirement (20 or 25 years).

The results of Mills' study showed that ACCP improved retention. The estimated increase in the probability of remaining on active duty to 20 YOS from 11 YOS is 19.68 percent. The estimated increase in retention to 20 YOS from 16 YOS is 29.72 percent. The estimated increase in retention to 25 YOS from 16 YOS is 13.90 percent. The estimated increase in retention to 25 YOS from 21 YOS is 8.86 percent. These estimated gains are based on cost of leaving calculations.[5]

Phillips' (2001) study applied a binomial logit model to evaluate the effect of fully funded graduate education on promotion to O-5 (CDR) and screening for squadron command (promote and screen) for eligible fixed-wing, carrier based aviation O-4 (LCDR). The data set involved all aviation officers (3,585) that the U.S. Navy considered for promotion to CDR during FY81 to FY89. These same officers would be eligible for promotion to O-6 (CAPT) in 1986 to 1995. This sample was restricted to

[5] ACCP had a significant impact on the retention of aviators in FY 00 as the continuation rates increased by 10 percent after four years of decline. Yet, even with this improvement, aviation is still short officers and retention will continue to be a key issue for the U.S. Navy. (Scorby, et. al.)

fixed-wing, carrier-based aviators, resulting in 1,817 observations. After further sanitization of the data set, the final data set consisted of 1,251 observations.

The binomial logit model included graduate and undergraduate education, commissioning source, marital status, plane type, and job occupation. Approximately, 90 percent of the officers sampled were married, with over 50 percent with two or more children. The largest percentage of undergraduate students was humanities majors (25.7 percent) followed by business majors (18.8 percent). Engineering, math, and science majors combined only accounted for 37.6 percent of the sample. OCS provided 50.8 percent of the officers while U.S. Naval Academy (USNA) graduates and Naval Reserve Officer Training Corps (NROTC) graduates accounted for 27.3 percent and 18.0 percent, respectively. (Phillips)

Overall, Phillips' study showed that aviators with fully funded technical degrees were 26.9 percent more likely to promote and screen than those without graduate degrees did. Officers who earned graduate degrees on their own time are 5.8 percent more likely to promote and screen than those without graduate degrees.

C. OTHER RETENTION MODELS AND STUDIES

Retention is not only a problem for naval aviation but also for other warfare communities and services. Numerous studies have been conducted to examine the various trends affecting retention within these organizations. An examination of these studies helps to understand the broader issues that may affect NFO retention.

Moore, Griffis, and Cavalluzzo's (1996) research memorandum quantified the effect that drawdown programs had on second-term retention (i.e. "Zone B" or seven to ten YOS) for enlisted sailors in the U.S. Navy. This research provided a general foundation for U.S. Navy enlisted personnel policies. The driving factor for this research stemmed from a 13 percent decline in retention between FY 92 and FY 94. This retention model included factors that drove a sailor's stay or leave decision, such as the following: civilian unemployment rate, career characteristics, family characteristics, and personal demographic characteristics.

The significant findings of this research were intriguing. For example, single women were more inclined to stay in the service than single men were, while married women were more inclined to leave than married men were. Having a military spouse improved the likelihood of a service member remaining with the service. Single parents were more likely to stay than married parents were. The probability of leaving decreased as the number of children increased. Sailors in higher pay grades were more likely to stay, as were those who are older and had longer lengths of service. Higher Armed Forces Qualification Test scores increased the likelihood of leaving the service. The unemployment rate also had a correlation with retention. For example, if the unemployment rate decreased by 1 point, the probability of personnel leaving increased by 2.2 points. (Moore, et. Al, 1996)

Gjurich's (1999) study validated a conceptual retention model for Surface Warfare Officers (SWO) with a model that originated from the Surface Warfare Community Manager. Gjurich used logistic regression and CART for validation. Data were obtained from the DMDC's OMF and results from a questionnaire administered to active duty SWOs. The data included 5,438 observations of SWO lieutenants serving between 1990 and 1998. The factors identified by the SWO Community Manager, CDR B. Sorce, included the civilian economy, inability to make plans, and family separation.

The results of Gjurich's analysis was that SWOs were more inclined to leave the U.S. Navy if they were USNA graduates, single or married with no children, and non-Caucasian. Note that this study did not address why SWOs were leaving but examined the characteristics of those that left. The study also noted that SWOs with graduate degrees were more inclined to stay in the U.S. Navy. (Gjurich, 1999)

Duffy's (2000) study developed multivariate models to estimate the determinants of retention in the Surface Warfare community to the O-4 (LCDR) promotion board. The logit models estimated retention as a function of personnel background, demographics, and early U.S. Navy experience.

Duffy examined the SWO retention issue from the perspective that STAYSWO was merely one of three options. The other two included staying in the U.S. Navy in a different warfare community (STAYNAVY) and leaving naval service completely

(LEAVERS). Additionally, Duffy modified the baseline regression model with factors associated with fleet experience (first ship type and fitness reports).

Duffy's study found positive relationships between SWO retention and serving initially on a cruiser or destroyer, having children, being older at commissioning, and being recommended for accelerated promotions more often as an O-1 (ENS) or O-2 (LTJG). In contrast, the study also found negative relationships between retention and higher undergraduate grade point average, undergraduate engineering degree, and commissioning via OCS.

Phelps (2001) study developed bivariate logit models to estimate the impact of marital status and dependent children on nuclear submarine officer (NUCS) retention beyond MSR. The data set included NUCS commissioned between 1977 and 1991 (n=4294).

Two models were specified, one for NUCS who remain in the service one to two years following MSR (RETAIN) and one for NUCS who remain for the LCDR promotion board (STAYER). The first logit STAYER model examined only marital status: *STAYER = f (married + commissioning source + undergraduate major + commissioning year group + age)*. The second logit model examined marital status and dependents: *STAYER = f (married with dependents + married without dependents + commissioning source + undergraduate major + commissioning year group + age).*

Phelps found a positive relationship between retention for NUCS beyond the MSR and being married with dependent children, being older at commissioning, and being commissioned via an enlisted commissioning program. Being commissioned via NROTC and OCS had a negative impact on retention.

D. ADDITIONAL NFO-SPECIFIC STUDIES

Since this thesis examines NFO training, retention, and promotion, other NFO specific studies seemed appropriate to help further understand the NFO community. Murray (1998) applied a binomial logit of either attrite or succeed to SNFO cohorts who entered training (API to FRS) from 1991 to 1996. He also analyzed a multinomial logit model that specified four possible outcomes: (1) attrition for performance, (2) attrition for medical, (3) dropping on request, and (4) successful completion.

Murray's study showed that relative to attrition for performance and dropping on request, USNA graduates had the lowest rate, followed by NROTC, and then OCS. Conversely, USNA graduates were more likely to attrite from training due to medical reasons followed by NROTC, and then OCS. Caucasian SNFOs had the lowest attrition rate. In addition, SNFOs with a technical undergraduate degree were more likely to succeed than SNFOs with a non-technical degree while all other variables remained constant.

Hafner's (2000) study examined gender, ethnicity, academic performance, major, military grades, and personality type as predictors of service selection, service assignment, and completion of NFO training for USNA graduates. The data set consisted of 357 USNA graduates from 1997 and 1998 for service selection and 161 observations of those assigned to NFO during service assignment. For NFO completion, the data consisted of 457 USNA graduates from 1992 through 1996. Of the 457 USNA graduates, 337 were designated (73.7 percent) NFO and 120 were not designated (26.3 percent).

The results of the study showed that gender, race, academic grades, major selection, and Myers-Briggs Type Indicator (MBTI) profile were not significant indicators as to whether USNA graduates would complete NFO training. An interesting result was that military grades[6] did positively correlate to completion of NFO training; thus the better the military grade, the increased likelihood of completing NFO training.

[6]USNA military grades consist of midshipmen's physical readiness test scores, professional military knowledge, and moral development.

E. CHAPTER SUMMARY

All of these studies illustrate the issue that the U.S. Navy is coping with regarding the retention of naval personnel. Training attrition reduces the number of qualified officers. Large percentages of qualified officers leave the service after MSR. What is the quality of the remaining officers remaining to promote to the LCDR pay grade? Are they the best of the best or simply the rest?

NFO retention may not be as great a problem as retention in other warfare communities; however, the U.S. Navy is using the difference to fill gaps left by those other warfare communities with the net result of continuing personnel shortages. Most of these studies helped illuminate problems that assisted in developing effective models to evaluate training, retention, and promotion within this thesis as discussed in Chapter IV. The data set to be evaluated will be discussed next in Chapter III.

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III. THE DATA

A. INTRODUCTION

The objective of this study is to identify trends in the training, retention, and promotion of NFOs commissioned from 1983 to 1990. To accomplish this, a pooled, cross-sectional time series database was created to encompass all naval officers who initially selected or transferred to the NFO community, NFOs who transferred out of the NFO community to a different warfare specialty, and NFOs who attrited out of NFO training. All of these officers have had the opportunity to leave following their MSR.[7]

The data set originated from the OMF and was cross-referenced with the U.S. Navy's Officer Loss File (OLF). Specifically, the U.S. Navy Bureau of Personnel (Bupers) provided data on the personal characteristics of naval officers at the LT promotion board. Then, the data was coded with additional variables (many are duplicate variables reviewed at the LT board) at the LCDR promotion board. Finally, the data set was cross-referenced with the OLF to include any naval officers that left service prior to the LT promotion board. Dr. William Bowman, USNA, provided the original "ALL OFFICERS" data of 34,734 naval officers commissioned from 1983 to 1990.

B. "ALL OFFICERS" DATA SET

From 1983 to 1990, 34,724 naval officers were commissioned. The three primary commissioning sources for U.S. Navy URL officers are USNA, NROTC, and OCS. Several other (OTHER) programs commission naval officers. Examples of these OTHER programs are senior enlisted to officer programs (e.g., Limited Duty Officers and Warrant Officers) and direct appointments for professionals such as doctors, nurses, dentists, lawyers, engineers, and chaplains.

[7] MSR for non-Aviation officers is typically four years following commissioning for these year groups. MSR for NFOs is a six-year service obligation following completion of flight training. This would remain constant even for officers that later transfer to become NFOs following a previous warfare specialty. For example, a SWO completes a tour on a ship, 18-24 months of a 48-month MSR. Upon acceptance into NFO training, the SWO agrees to accept follow-on sea tour orders if the SWO who attrite during NFO training or upon completion of NFO training of approximately 18 months, accepts a six-year MSR. This would result in the then-SWO, now-NFO of having at least nine years in service prior to being able to leave the naval service.

Figure 5. Naval Officers Commissioning Source

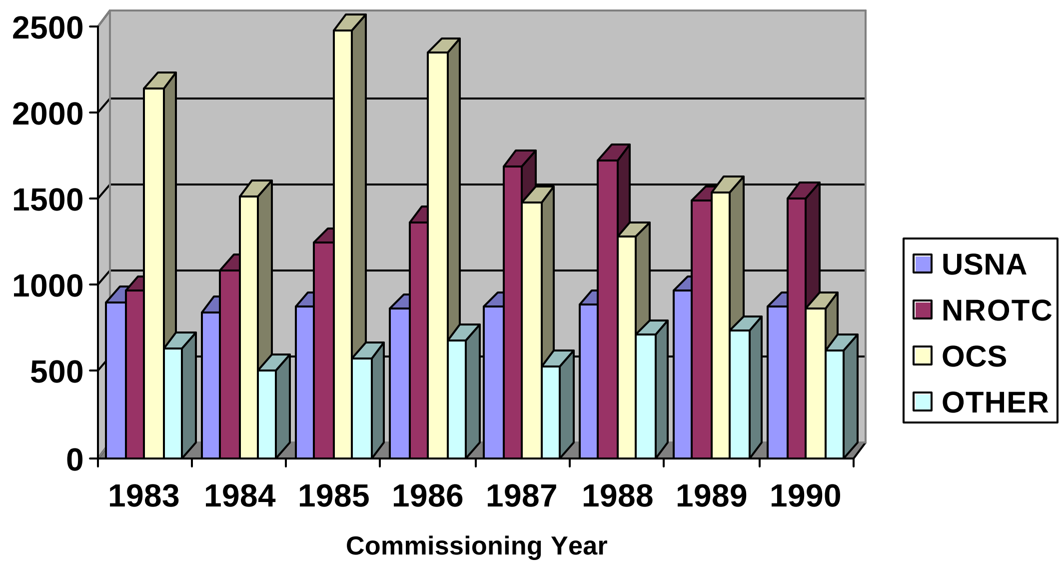


Figure 5 presents the distribution of naval officers from commissioning sources by YG. Omitted from this figure are those individuals for which the commissioning source was unknown. These unknowns (47 observations) accounted for less than .1 percent of the data. For this data, OCS graduates accounted for 37 percent of commissioned naval officers from 1983 to 1990 collectively with 1985 being the peak year with 2,477 officers commissioned. NROTC graduates accounted for 30 percent.[8] USNA graduates accounted for 19.2 percent. OTHER commissioning sources accounted for 13.6 percent. Congress mandates how many personnel may attend USNA, resulting in an annual average of 884 graduates over the eight observed years. Therefore, OCS provides the primary means to augment shortfalls in personnel during periods of DoD growth as characterized in the 1980s. The largest accessions of OCS naval officers occurred in the early 1980s. In the mid to late 1980s, OCS accessions decreased as NROTC numbers increased.

Figure 6 shows the percentage of male and female naval officers per YG. From 1983 to 1990, females accounted for an average of 12.3 percent of all naval officers

[8] NROTC in Figure 5 combines both NROTC scholarships and NROTC contracts into a single NROTC group.

commissioned. In 1983, the U.S. Navy commissioned 674 females, 14.5 percent of all new accessions, the most during the observed years. This observed high point was nearly matched in 1990 when females accounted for 14.4 percent of new accessions.

Figure 6. Naval Officer Gender Percentages

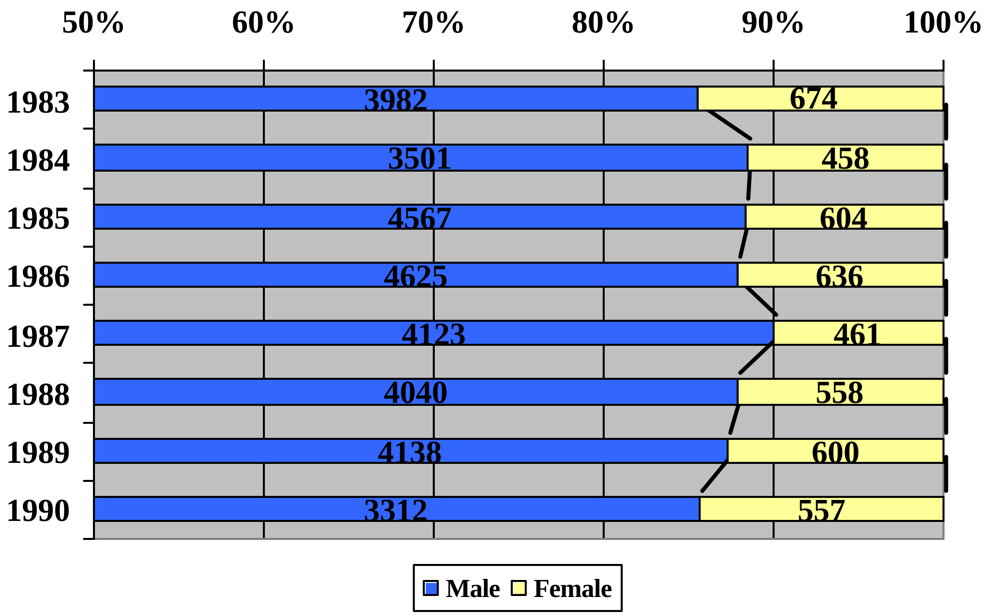


Figure 7, the distribution of naval officers by race/ethnicity and YG, shows the general trends. Omitted from this figure are those from Native American and unknown or undisclosed heritage. These omitted (50 Native American and 139 unknown cases) accounted for .5 percent of the data. The remaining racial and ethnic groups are Caucasian, African-American, Hispanic, and Asian. For this data collectively, Caucasians contributed 90.8 percent of naval officers commissioned followed by African-Americans (5 percent), Hispanics (2 percent) and Asians (1.6 percent). There is an increase in diversity over time. In 1983, the percentage of Caucasians commissioned was 92.1 percent vice African-Americans (4.4 percent), Hispanics (2.3 percent), and Asians (.9 percent). In 1990, Caucasians were 87.5 percent, African-Americans were 6.5 percent, Hispanics were 2.8 percent, and Asians were 2.8 percent.

Figure 7. Naval Officer Ethnic Percentages

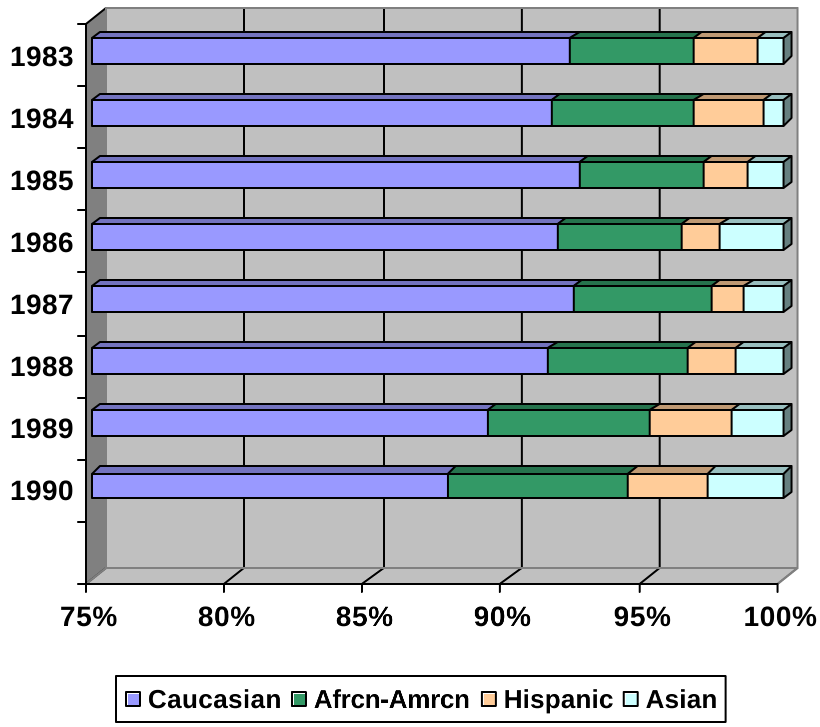


Figure 8 shows the distribution of naval officers by age and commissioning source. Omitted from this figure are 48 observations (.1 percent) with an unknown commissioning source. The graph shows that most officers are commissioned at 22 years of age. It is at this age that most USNA and NROTC students graduate. OCS continues to provide a substantial number of naval officers (more than 500) up to the age of 28. In addition, OCS provides numerous naval officers up to the age of 34. OTHER sources lead in number of ascensions from ages 29 to 35. This last observation corresponds to senior enlisted and professionals joining the naval officer ranks.

Figure 8. Naval Officer Commissioning Age by Source

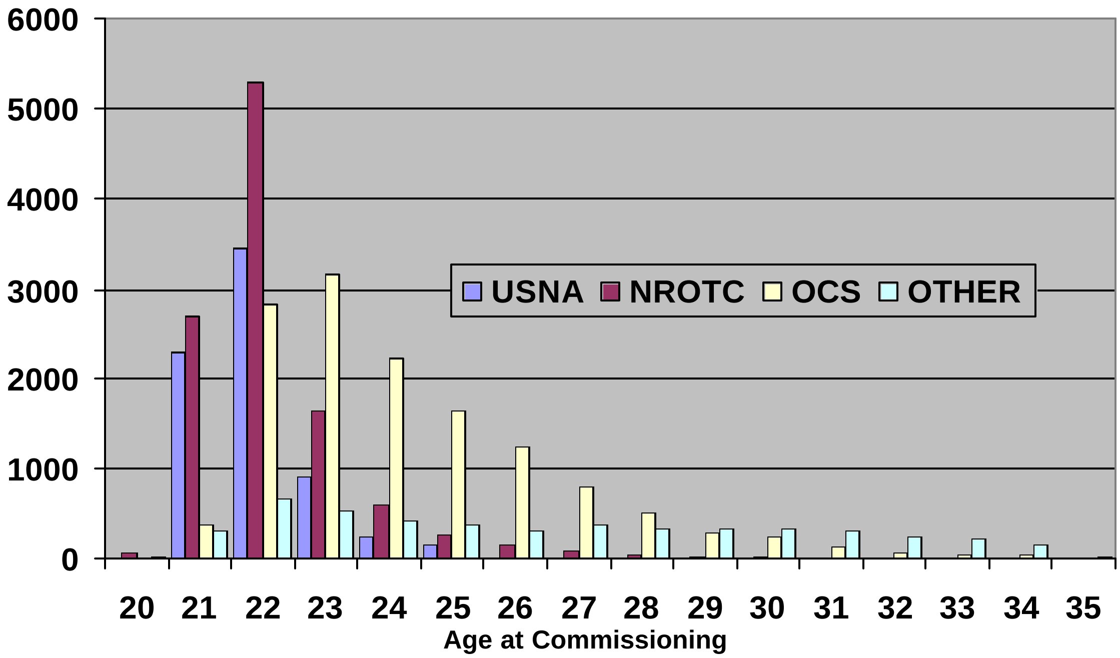


Figure 9 shows the distribution of male naval officers by their respective LT board designators and commissioning source. The largest male contribution was from NROTC (46.7 percent) to SWO. OCS contributed the most males to subs, pilots, and NFOs (39.4 percent, 49.2 percent, and 45.4 percent, respectively). Naval aviation (Pilots and NFOs) consisted of 35.2 percent (23.5 percent and 11.7 percent) of all male naval officers. SWO and subs consisted of 30.7 percent and 12.3 percent, respectively.

Figure 9. Male Naval Officer LT Board Designation by Source [9]

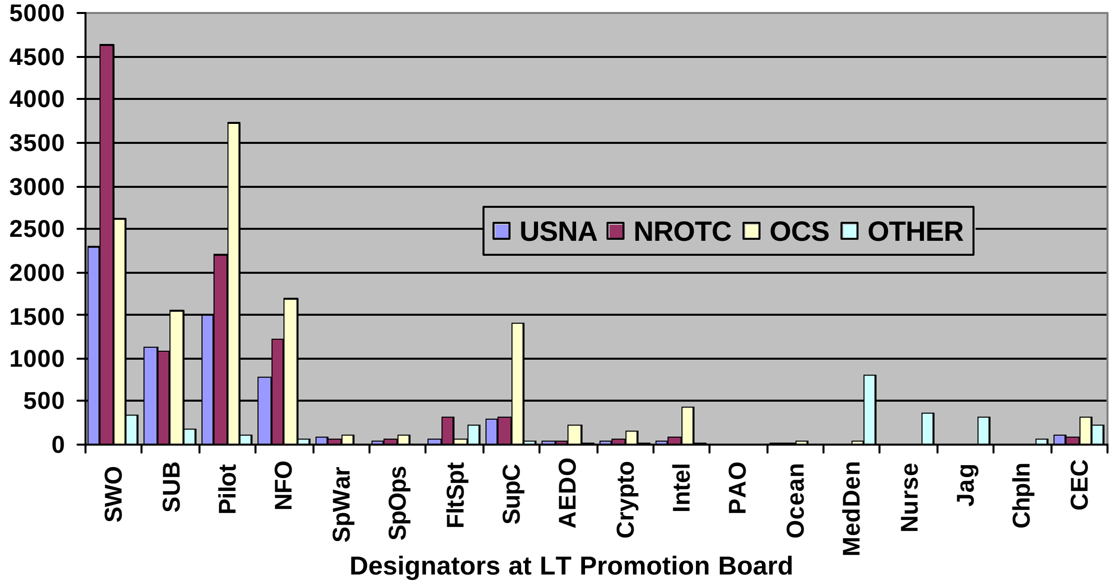
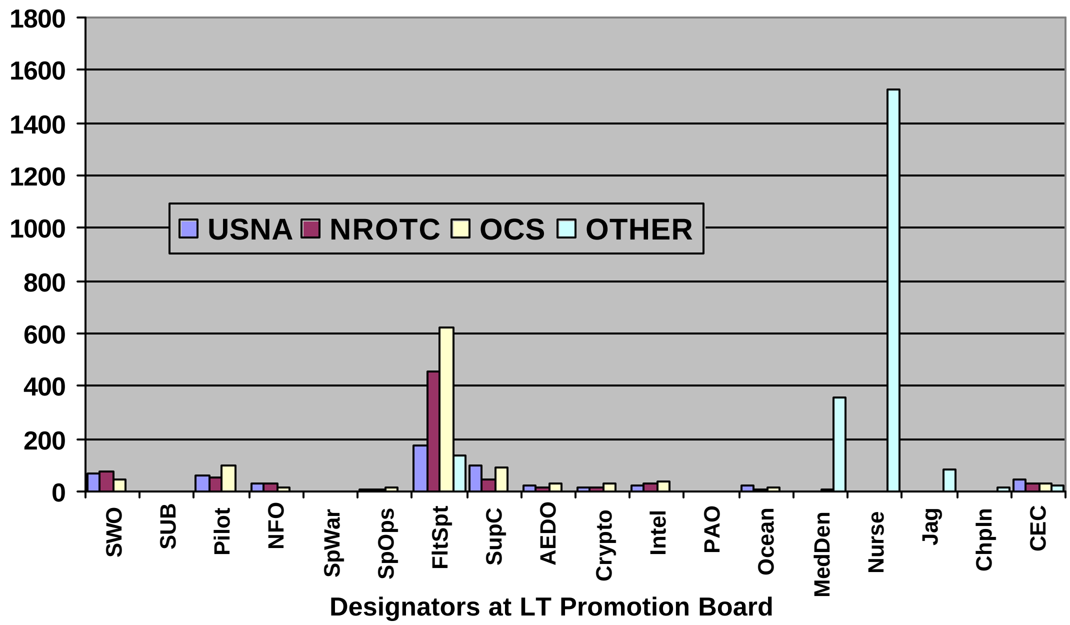


Figure 10. Female Naval Officer LT Board Designation by Source [8]



[9] These designations of naval officers are a snapshot at their four-year career point. Even though the percentage of lateral transfers within the U.S. Navy is small, <5 percent; this snapshot does not factor the lateral transfer of officers prior to or after this promotion board screening.

Figure 10 shows the distribution of female naval officers by their respective LT board designators and commissioning source. The largest contribution (33.6 percent) was from OTHER by direct appointment to the nurses corps. Fleet Support receives the next largest contribution (30.6 percent) of female officers from OTHER as well as the largest contribution from USNA, NROTC, and OCS.

C. "NFO" DATA SET

From 1983 to 1990, 4,490 Ensigns, Lieutenant Junior Grades, and Lieutenants initially selected or transferred to the NFO community. This data set also contained those NFOs who transferred out of the NFO community to a different warfare specialty, attrited out of NFO training, or left the service. Descriptive statistics and charts for NFOs are included to provide further comparison.

Similar to "ALL OFFICERS," the three primary commissioning sources for NFOs are USNA, NROTC, and OCS. Several other officers that transferred into the NFO community originated from OTHER programs but were omitted from Figure 8 because they only constituted 2 percent.

Figure 11 shows the distribution of NFOs by commissioning sources for each YG. As in Figure 5 for "ALL OFFICERS," total numbers increased in 1985 and then gradually declined through 1990. However, several differences are notable. One difference for NFOs is that OCS graduates accounted for 45 percent of commissioned naval officers from 1983 to 1990 collectively. The peak year was 1985 with 378 (53.5 percent) officers commissioned. NROTC graduates accounted for 33.9 percent.[10] USNA graduates accounted for 19.1 percent. OTHER commissioning sources accounted for 2 percent.

[10] NROTC in Figure 5 combines both NROTC scholarships and NROTC contracts into a single NROTC group.

Figure 11. NFO Commissioning Sources

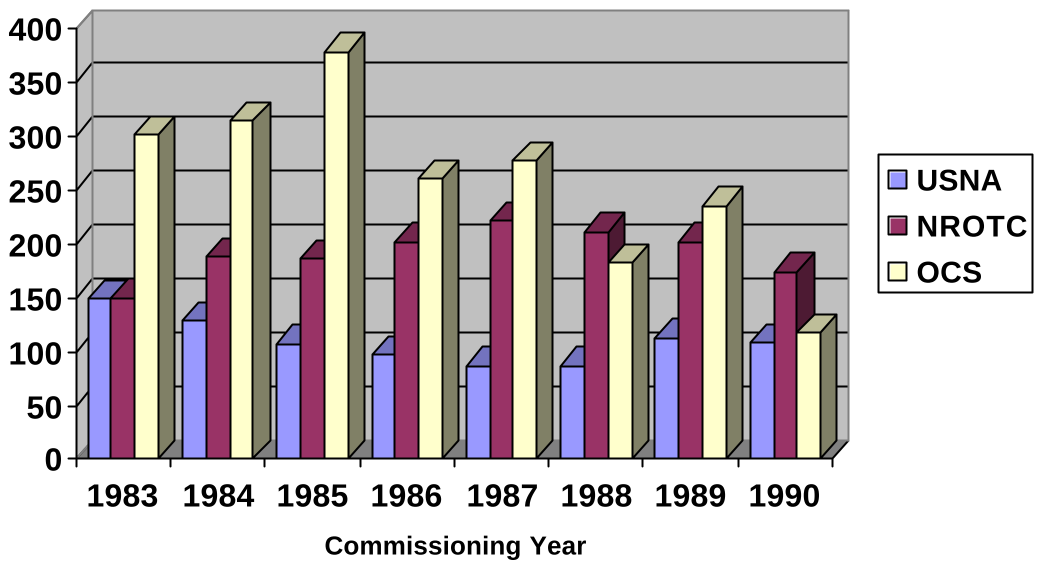


Figure 12. NFO Gender Percentages

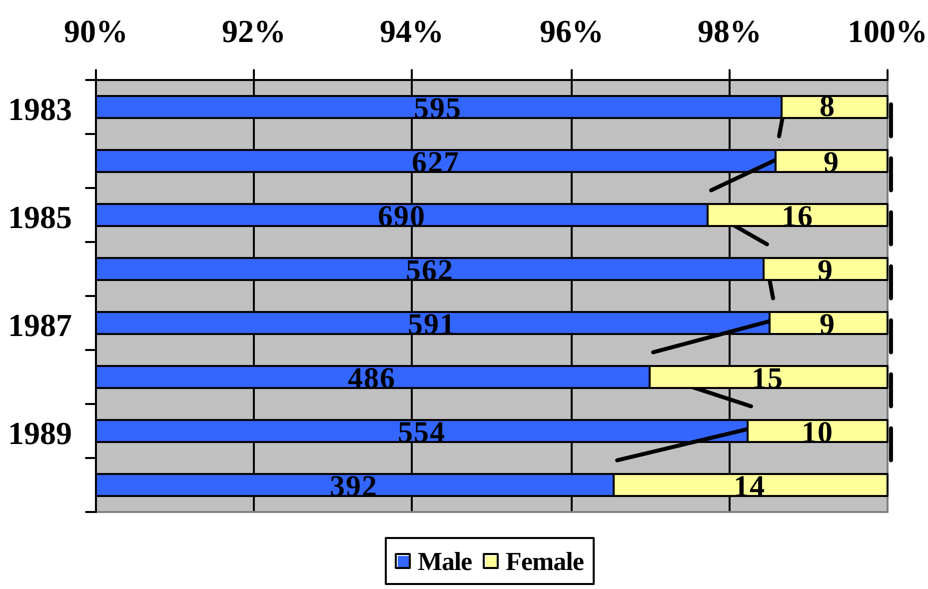


Figure 12 shows the percentage of male and female NFOs per YG. From 1983 to 1990, females accounted for an average of 2 percent of all NFOs commissioned. In comparison to the 674 (14.5 percent) female naval officers commissioned in 1983, only eight (1.3 percent) women out of 603 prospective NFOs became members of the NFO

community. By 1990, this number had increased to 14 (3.4 percent) of 406 prospective NFOs.

Figure 13 shows the distribution of NFO by ethnicity and YG. Omitted from this figure were Native Americans, unknowns, or undisclosed heritage. These omitted (eight Native American and six unknown cases) accounted for .3 percent of the data. The remaining ethnic groups were Caucasian, African-American, Hispanic, and Asian. For this data collectively, Caucasians contributed 93.2 percent of prospective NFOs commissioned followed by African-Americans (3 percent), Hispanics (1.9 percent), and Asians (1.5 percent).

Figure 13. NFO Ethnic Percentages

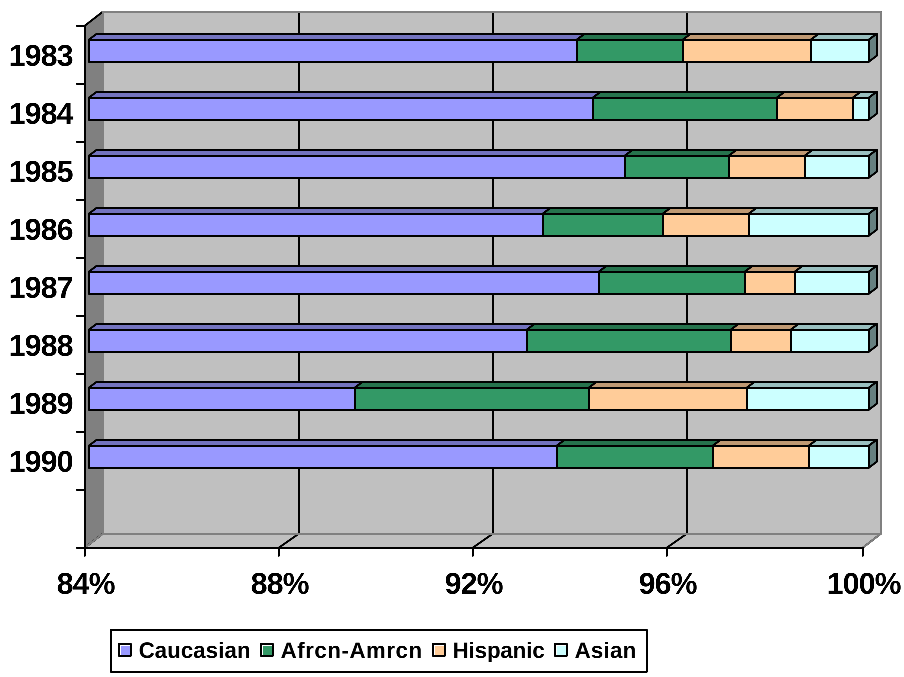
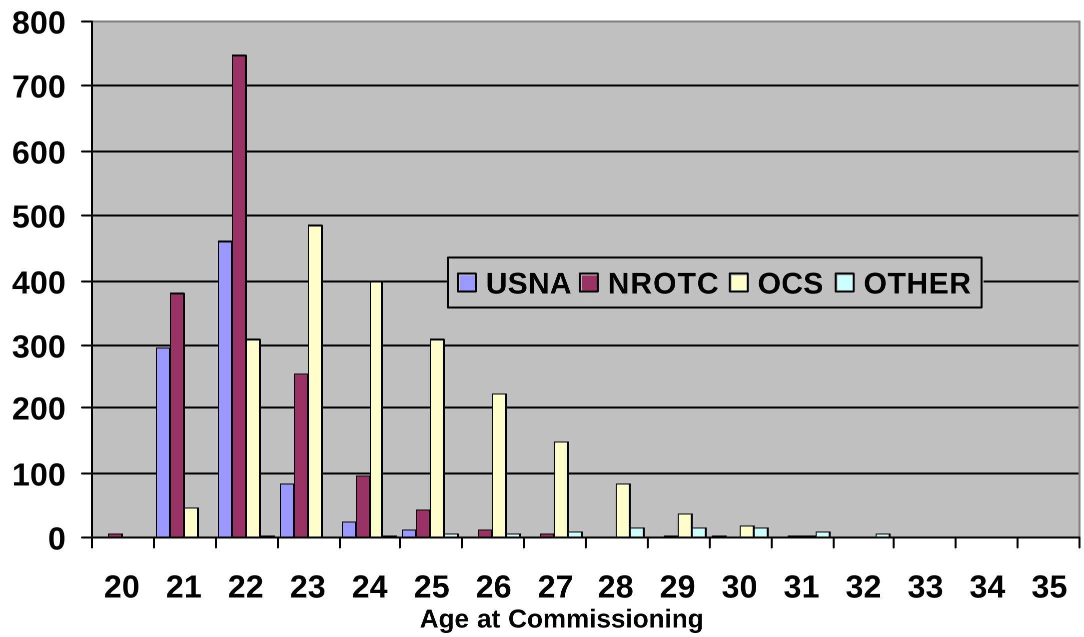


Figure 14 shows the distribution of naval officers by age and commissioning source. Omitted from this figure were 48 observations (.1 percent) whose commissioning source was unknown. The graph demonstrates clearly that 22 is the most common age of commissioned officers. Most USNA and NROTC students graduate this age. OCS, more

so than other commissioning sources, provided a substantial number of older NFOs up to age 30. OTHER sources lead in number of ascensions of 31 and 32 year olds.

Figure 14. NFO Commissioning Age by Source



Figures 15 and 16 show the distribution of male and female prospective NFOs by their respective LT board designators and commissioning source. The largest male NFO contribution was from OCS (45.4 percent) followed by NROTC (33.7 percent) and USNA (18.8 percent). However, the largest female NFO contribution was from NROTC (42.2 percent) followed by USNA (33.3 percent) and OCS (23.3 percent).

Figure 15. Male NFO LT Board Designation by Source[11]

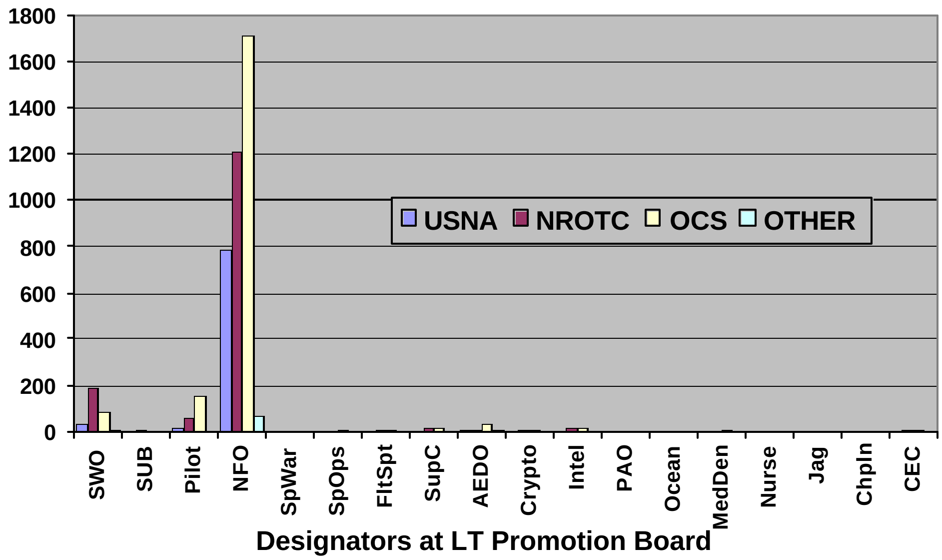
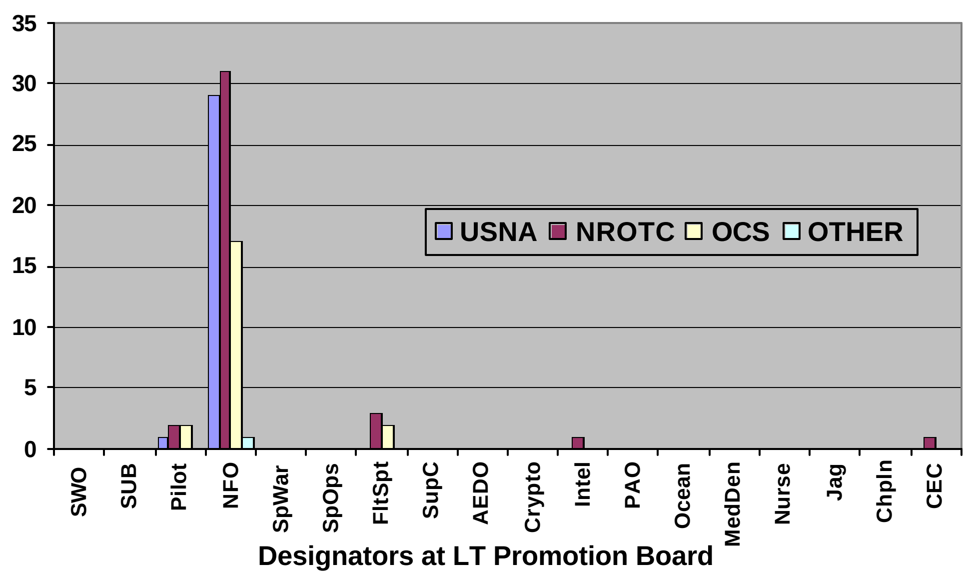


Figure 16. Female NFO LT Board Designation by Source[11]



[11] These designations of naval officers are a snapshot at their four-year career point. Even though the percentage of lateral transfers within the U.S. Navy is small, <5 percent; this snapshot does not factor the lateral transfer of officers prior to or after this promotion board screening.

D. CHAPTER SUMMARY

This chapter described the origination of the "ALL OFFICERS" data set and the subset "NFO" data set. The purpose was to determine if any outliers of the data could be identified.

The only one outlier from the data is noted. The identified outlier is the proportion of female naval officers to the proportion of female NFOs.[12] Initially, the component difference of 10.3 percent is noteworthy. However, further analysis reveals that a large percentage of women are either nurses or fleet support. The large percentage of women in fleet support may be attributed to old laws that restricted female service on combatant warships. (Keegan, 1999) Calculating the percentage of female naval officers in other URL communities results in similar percentages: SWOs (1.97 percent), pilots (2.72 percent) and NFOs (2.02 percent).

The next chapter will provide models and respective independent and dependent variables associated with frequencies. Specifics of the "NFO" data set will also be presented at this point.

[12] Referring to Figure 6, the average percentage of women commissioned officers was 12.3 percent. Referring to Figure 12, the average percentage of women commissioned as NFOs was 2.0 percent. The difference from these two numbers is 10.3 percent.

IV. DATA METHODOLOGY

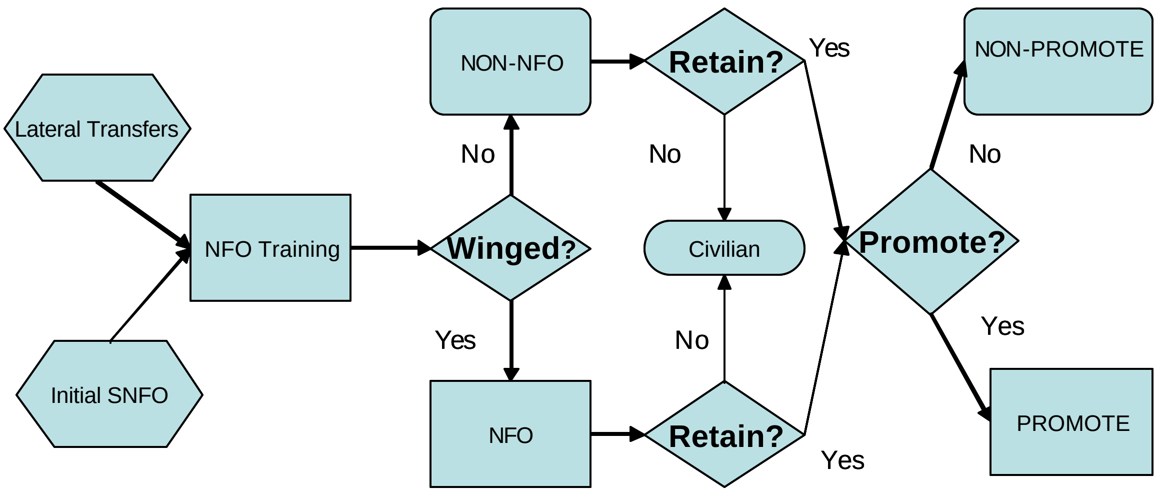
A. VARIABLE DEFINITIONS

There are numerous factors involved in any career. For example, how an individual performs in high school often determines the type of college the individual will attend. Educational decisions and associated experiences can be potential differences in an individual's career success or failure. Returning the focus back to NFOs, educational decisions and their effects will be examined. Performance in this study is defined as an increased likeliness for promotion to LCDR.

In addition to examining how these collegiate-level decisions influence individual's performance, career decisions will be examined. One career decision is changing jobs within an organization. In the U.S. Navy, this is called "lateral transfers." Another career decision involves a junior person seeking both advancement and a career change, such as prior enlisted sailors enhancing their careers by becoming officers. Personal decisions such as marriage and children also often influence career decisions.

These various factors will be the variables addressed within the logit models to explore the determinants of SNFOs and NFOs who completed training, who retained until the LCDR promotion board, and who promoted to LCDR. This chapter will attempt to provide an overview of the dependent and independent variables, the reasons for their inclusion, and their hypothesized effects.

Figure 17. Flowchart of Methodology



1. Dependent Variables

This thesis creates dichotomous dependent variables based on the objective of determining the determinants of SNFOs that completed training, NFOs retained until the LCDR promotion board, and then those NFOs actually promoted to LCDR. These dependent variables are NFOWING, LCDRSTAY, and LCDRPROM.

Figure 17 shows the methodology for evaluating dependent variables. Within the flowchart, "Winged" represents the variable NFOWING. "Retain" represents the variable LCDRSTAY. "Promote" represents the variable LCDRPROM. A "1" for those variables equals a "yes" on the flowchart, and a "0" equals a "no."

NFOWING is composed of SNFOs that successfully complete NFO training and earn their wings of gold (86.6 percent). These individuals are coded a one. A zero is coded for all others. This variable is based on the NFO wing designation date from the data set. This dependent variable for completion of training also includes those NFOs that laterally transfer to a different community later.

LCDRSTAY is composed of naval officers in the NFO data set that retained until the LCDR promotion board (53.0 percent). This variable is dummy coded with a zero for those naval officers that are not retained. A one is used for both NFOs that successfully

complete training and SNFOs that fail to complete training yet are still in the U.S. Navy at the LCDR promotion board.

LCDRPROM is composed of those naval officers in the NFO data set that are selected for promotion at the LCDR promotion board (67.0 percent). This variable is dummy coded with a zero for those naval officers that are not selected and a one is used for those that are selected.

Table 1 shows the number of cases and mean value for the dependent variables. The mean values are the percentages that actually complete the career progression milestones that the dependent variables represent. Collectively, 30.8 percent[13] of sampled NFOs will complete training, remain for the O-4 Board, and promote to LCDR.

Table 1. Descriptive Statistics of Dependent Variables

VARIABLES	CASES	MEAN VALUE	STANDARD DEVIATION	VARIANCE
NFOWING	4490	.866	.340	.116
LCDRSTAY	4490	.530	.500	.25
LCDRPROM	2365	.670	.470	.22

2. Independent Variables – Personal

Gender. The GENDER variable is coded with a dichotomous[14] value with zero equating a male and one equating a female. Ninety-eight percent of the entire prospective NFO population is male. Due to homogeneity, this variable will probably result as a non-determinant in the analysis. Male is listed as the reference category in the "Expectations" column in Table 2. The "Expectations" column provides the direction of the relationship between each variable and the various outcomes.

[13] (.866 * .530 * .670) = .308.

[14] Dicotomous variables will be dummy coded either a value of "1" if true or a "0" if false.

Table 2. Descriptive Statistics of Gender

VARIABLES	CASES	PERCENT	EXPECTATIONS
GENDER	4490	100.0	**WINGING/STAY/PROMOTE**
MALE	4402	98.0	REFERENCE
FEMALE	88	2.0	?

Race/Ethnicity. Race/Ethnicity has been divided into four categorical[15] variables (ETHNCGRP) representing the major racial and ethnic groups within the military and labeled Caucasian, African-American, Hispanic, and Other. Other includes Native Americans, Asian, and Pacific Islanders. Since these numbers are small, ethnic minorities are also grouped as a single group, dummy coded MINORITY with a one equating to a member of any racial or ethnic minority and a zero not. Only one of these two variables is used in each of the three models. Initially, ETHNCGRP is used in each model initially to examine if any ethnic group has significant results. If no significant results occur, then the single MINORITY dichotomous variable is used to test for significant results for ethnic minorities as a whole.

Table 3. Descriptive Statistics of Ethnicity

VARIABLES	CASES	PERCENT	EXPECTATIONS (WINGING/STAY/PROMOTE)
MINORITY	4490	100.0	? / + / ?
CAUCASIAN	4187	93.3	REFERENCE
AFRCNAMRCN	142	3.2	? / + / ?
HISPANIC	83	1.8	? / + / ?
OTHER	78	1.7	? / + / ?

15 Categorical variables are not dummy coded as the dichotomous variables are. Categorical variables are coded into one of the groups for that respective variable.

Expectations for are that there should be no significant differences between the racial and ethnic groups in terms of the training outcome because all SNFOs should meet the minimum academic requirements set by Navy Military Personnel Manual (MILPERSMAN), section 6610360, and have been tested by the Aviation Selection Test Battery (ASTB). In addition, minorities are hypothesized to be more likely to remain because of the emphasis on equality of opportunity that exists within the DoD. Because of this equality, expectations are that promotions will not differ by race/ethnicity.

Age. The age of an officer at the time of commissioning is accounted for by creating two different categorical groupings of variables. The first group is AGEGRP3, which groups cases into three categories: 20-22, 23-24, and 25+. The second group is AGEGRP5, which groups cases into five categories: 20-22, 23-24, 25-26, 27-28, and 29+.

Table 4. Descriptive Statistics of Age

VARIABLES	CASES	PERCENT	EXPECTATIONS
AGEGRP3	4490	100.0	**WINGING/STAY/PROMOTE**
AGE 20-22	2218	49.4	REFERENCE
AGE 23-24	1305	29.1	+ / + / +
AGE 25+	967	21.5	+ / + / +
AGEGRP5	4490	100.0	**WINGING/STAY/PROMOTE**
AGE 20-22	2218	49.4	REFERENCE
AGE 23-24	1305	29.1	+ / + / +
AGE 25-26	598	13.3	+ / + / +
AGE 27-28	259	5.8	+ / + / +
AGE 29+	110	2.4	+ / + / +

Expectations for age are based on the premise that the older a NFO is at the time of commissioning, the more inclined the NFO is to complete training, remain in the naval service to be eligible for retirement, and work harder to promote to LCDR. This is

because older commissioned officers have already had the opportunity to pursue different career options and have additional experiences to build upon, whereas the reference age group has only known naval service since graduating high school (for USNA graduates) or college (for NROTC graduates). Thus, older NFOs join the naval career as an alternative to something else. However, a majority of the 20-22 year olds NFOs have not known anything other than the U.S. Navy. Dissatisfaction with the naval service would more likely have them seek alternative careers.

Undergraduate Major. To account for the type of education a person receives, the dummy variable NONTECH is created. A one signifies that the naval officer has a non-technical undergraduate degree while a zero signifies a technical degree. A technical degree is defined as a degree in engineering, math, computer science, or physics and all other degrees (e.g. business, social studies, humanities, political science, economics, and biology) are defined as non-technical.

An expectation is that a more technical naval officer will perform better in flight training than a non-technical officer because of the technical nature of the naval aviation curriculum. An increase in proficiency during the training phase should result in enhanced job satisfaction in the fleet. This will enhance performance and improve a naval officer's chance for promotion.

Table 5. Descriptive Statistics of Undergraduate Major

VARIABLES	CASES	PERCENT	EXPECTATIONS
NONTECH	4490	100.0	**WINGING/STAY/PROMOTE**
TECHNICAL	1863	41.5	REFERENCE
NON-TECHNICAL	2627	58.5	- / - / -

Barron's Code (BC). Barron's Profile of American Colleges categorizes colleges into one of seven tiers with the most competitive schools (top 10 to 20 percent of high school class with Scholastic Aptitude Test [SAT] scores of 1250 to 1600) for admissions with a value of one. A value of two represents highly competitive schools (top 20 to 35 percent of high school class with SAT scores of 1150 to 1250). A value of three

represents very competitive schools (top 35 to 50 percent of high school class with SAT scores of 1050 to 1150). A value of four represents competitive schools (top 50 to 65 percent of high school class with SAT scores of 900 to 1050). A value of five, six, or seven represents less competitive, noncompetitive, and specialty schools, respectively. Appendix D contains an alphabetical listing of schools and Barron's corresponding code. (Barron's, 1986)

By using BC, the independent variable BQEDU is coded into four categories (1-4) for the NFO cohort as shown in Table 6. USNA and Unknowns are two additional categories. Even though Barron's rates USNA as a one, it is recoded as a zero and is the comparison variable for all other schools. The last variable is coded a five to include unknowns as a collective group. Table 6 also includes the different expectations for these categorical groups.

Table 6. Descriptive Statistics of Barron's Quality of Education

VARIABLES	CASES	PERCENT	EXPECTATIONS
BQEDU (BARRON'S CODE AND RANKING)	4490	100	**WINGING/STAY/PROMOTE**
USNA	869	19.4	REFERENCE
HIGHLY AND VERY SELECTIVE (BC 1 & 2)	581	12.9	-/ - / +
VERY COMPETITIVE (BC 3)	1064	23.7	- / + / +
COMPETITIVE (BC 4)	981	21.8	- / + / +
LESS COMPETITIVE, NON-COMPETITIVE, AND OTHER(BC 5, 6, & 7)	566	12.6	- / + / -
BC UNKNOWN	429	9.6	- / + / -

The expectation is that the most competitive schools provide a better the education and are more likely to earn their wings. As USNA is the reference group as well as a BC 1, all other groups are comprised of less competitive (BC > 1) schools.

The expectation regarding retention is that naval officers with an education from BC 1 and 2 schools (most competitive) are less inclined to remain in naval service due to the prospective pay differences of naval officers and private sector professionals. The

expectations regarding BC 3, 4, 5, 6, and 7 schools are that naval officers will be more inclined to remain in service as pay for naval officers is good compared to many other occupations.

Regarding the probability to promote, those officers that remain from BC 1, 2, 3, and 4 schools will be more likely to promote, as they will have had exposure to more diverse groups than USNA graduates. Whereas, naval officers with an education from BC 5, 6, and 7 schools will have more difficulty obtaining promotion because of the non-competitive nature of their educational background compared to USNA graduates.

Dependent Status. Marital and dependent status is the final personal variable examined. There are two different categorical groupings of variables, MARRYLT and HMARRYLC. The first, MARRYLT (Table 7) is measured just prior to the LT promotion board, which occurs approximately three years after commissioning. HMARRYLC (Table 8) is measured just prior to the LCDR promotion board, which occurs approximately nine years after commissioning. These two variables assist in determining the effect of dependent status on retention and promotion. Categories within these variables include (1) single-no dependents, (2) single-with dependents, (3) married-no kids, (4) married-one kid, (5) married-two, or (6) married with three or more kids.

MARRYLT is the categorical variable used in the retention model and HMARRYLC is the categorical variable used in the promotion model. An expectation is that single sailor with dependents and married sailors regardless of dependent status will be more productive and therefore be more likely to promote than single sailors with no dependents. This expectation is based on various writings about the theory of increased productivity of married males.

Table 7. Descriptive Statistics of LT Board Dependent Status

VARIABLES	CASES	PERCENT	EXPECTATIONS
MARRYLT (STATUS/NUMBER OF DEPENDENTS)	4490	100.0	RETENTION
SINGLE/0	2281	50.8	REFERENCE
SINGLE/1+	23	.5	+
MARRIED/0	1524	33.9	+
MARRIED/1	404	9.0	+
MARRIED/2	187	4.2	+
MARRIED/3+	71	1.6	+

Table 8. Descriptive Statistics of LCDR Board Dependent Status

VARIABLES	CASES	PERCENT	EXPECTATIONS
HMARRYLC (STATUS/NUMBER OF DEPENDENTS)	2365	52.7 (100)	PROMOTION
SINGLE/0	418	9.3 (17.7)	REFERENCE
SINGLE/1+	31	.7 (1.3)	+
MARRIED/0	616	13.7 (26)	+
MARRIED/1	486	10.8 (20.5)	+
MARRIED/2	597	13.3 (25.2)	+
MARRIED/3+	217	4.8 (9.2)	+

Due to the “always on the go” lifestyle associated with the military, being single will have a negative affect on the retention model because more single sailors will leave the naval service in search of a slower pace needed to establish a relationship. In addition, married personnel with dependents will remain more than single sailors do because of the associated medical and dental benefits received by the service member’s dependents.

3. Independent Variables – Professional

Commissioning Source. The categorical variable NFOSRC, which contains the categories USNA, NROTC, and OCS, is created for commissioning source. An expectation of officers commissioned via NROTC and OCS is that both sources have a lower probability of earning their wings, staying in the service, and promoting to LCDR than officers commissioned via USNA. This expectation results because officers that attend USNA join with a purpose to serve their country as a naval officer and are indoctrinated with traditional naval core values over four years. In addition to this personal desire and indoctrination, these officers also receive additional training that neither NROTC nor OCS personnel receive.

Table 9. Descriptive Statistics Commissioning Source

VARIABLES	CASES	PERCENT	EXPECTATIONS
NFOSRC	4490	100	**WINGING/STAY/PROMOTE**
USNA	869	19.4	REFERENCE
NROTC	1517	33.8	- / - / -
OCS	2104	46.9	- / - / -

Prior Enlisted. Prior enlisted service is considered professional experience that has a positive impact on training, retention, and promotion. This positive impact results because sailors earn recommendations from their supervisors for acceptance into one of various accession pipelines. Earning these recommendations requires hard work and determination. In addition, these sailors have been at the bottom of the chain of command and will have additional insights that could help them when leading personnel. Therefore, a dichotomous variable is created called PRIORE, with a one signifying prior enlisted service and a zero not.

Table 10. Descriptive Statistics of Prior Enlisted

VARIABLES	CASES	PERCENT	EXPECTATIONS
PRIORSER	4490	100.0	**WINGING/STAY/PROMOTE**
PRIOR CIVILIAN	4203	93.6	REFERENCE
PRIOR ENLISTED	4490	6.4	+ / + /+

Platform. A categorical variable, NFOCMMTY, is created to consider the three NFO training pipelines and associated aircraft communities. These three communities are (1) Carrier Jet, (2) Hawkeye, and (3) Maritime. In addition to these variables, two other variables are included (4) Unknown NFO type and (5) non-NFO. Carrier Jet is the reference group because this community has the most NFOs.

This variable provides a control measure by which to offset inherent differences regarding the amount of time required to earn wings for these different communities. This variable is applied in the retention and promotion models. Expectations for Hawkeye NFOs are positive to offset the longer time to train than the overall average. Expectations for maritime NFOs are negative to offset the lesser time to train than the overall average. Regarding non-NFOs, expectations are that non-NFOs will be less likely to remain and promote because of their failure to complete NFO training regardless of the reason.

Table 11. Descriptive Statistics of NFO Community

VARIABLES	CASES	PERCENT	EXPECTATIONS
NFOCMMTY	4490	100	**STAY/PROMOTE**
CVN JET	2014	44.9	REFERENCE
HAWKEYE	436	9.7	+/+
MARITIME	1412	31.4	-/-
UNKNOWN	28	.6	?
NON-NFO	600	13.4	- / -

Graduate Education. A dummy variable, GRADED, is created to determine if a naval officer has a graduate degree when being considered for LCDR. A one signifies the officer has a graduate degree and a zero not. Since Phillips' (2001) study shows that graduate education improved probability for selection for Commander (O-5, CDR), the expectation is that an officer is more likely to promote if the officer has a graduate degree.

Table 12. Descriptive Statistics of Graduate Education (relative to LCDRSTAY)

VARIABLES	CASES	PERCENT	EXPECTATIONS
NFOGRDED	2365	100	PROMOTE
NONE	1756	74.2	REFERENCE
GRADUATE DEGREE	609	13.6	+

Lateral Transfers. Two different variables are created to take into account the effect of lateral transfers. The primary variable is a categorical variable called LATTRAN. LATTRAN represents whether an officer laterally transfers to or from the NFO community any time during the naval officer's career. A zero signifies that the officer has continuous involvement in naval aviation up to the LCDR promotion board. A one signifies that the officer transfers to SNFO and then successfully completes training to designate as a NFO. A two or three signifies that either an initial or transfer SNFO failed to complete training, respectively. A four signifies that a NFO transfers out of the NFO community sometime after wings are earned but before the LCDR promotion board.

LATTRAN variable is used in the retention and promotion models, as SNFOs who attrite are zeros in the NFOWING model by default. To account for this, a second variable, TRANSTO is used in the training model. TRNSTO represents a dummy variable to quantify the effects of lateral transfers on those that attempt to earn their wings of gold. A zero represents those SNFOs who initially select the NFO community.

A one represents all other officers who transfer into the SNFO pipeline with a desire to become NFOs. This variable is determined by referring to LATTRAN (1) and (3) values.

Table 13. Descriptive Statistics of SNFO Lateral Transfers

VARIABLES	CASES	PERCENT	EXPECTATIONS
TRNSTO	4490	100	WING
ORIGINALLY NFO	4141	92.2	REFERENCE
TRANSFER TO NFO	349	7.8	+

Expectations of TRNSTO are positive because these SNFOs have proven themselves by earning the respect of their previous commands and obtaining recommendations necessary to transfer to the NFO community. The expectations of LATTRAN are mixed. For the Transfer NFO, a positive relationship is expected because the adjust MSR associated with flight school. However, at the time for the promotion boards, these individuals will be behind their new NFO peers with regard to the NFO career path, thus a negative relationship is expected. For the SNFOs who attrite, negative relationships are expected because of the officer's failure to complete training as assigned. For NFOs that transfer out of the NFO community, a positive difference in retention is expected because of additional MSR requirements and a negative relationship for promotion is expected because these individuals are behind their new peers.

Table 14. Descriptive Statistics of All Lateral Transfers

VARIABLES	CASES	PERCENT	EXPECTATIONS
LATTRAN	4490	100	STAY/PROMOTE
ALWAYS NFO	3302	73.5	REFERENCE
TRANSFER NFO	340	7.6	+ / -
SNFO ATTRITE	591	13.2	- / -
TRANSFER SNFO ATTRITE	9	.2	- / -
NFO TRANSFER	248	5.5	+/-

Months to Wing. This categorical variable is created to evaluate the time required by NFOs to earn wings. This variable, MTWING, represents the performance measure which individual SNFO performance is evaluated.

This measure is based on the difference between a NFO's designation date and date of initial commissioning. The date of initial commissioning is not the ideal date to use. The ideal would be when the SNFO began flight school and start to earn flight pay. Unfortunately, this date is not included within the data set. The initial commissioning date is not considered ideal because numerous delays occur en route to flight school from commissioning.

There also appears be an unfair comparison to lateral transfers; however, the MTWING categories are designed to consider this inherent difference. Because all of the SNFOs are compared to the same measure, MTWING does provide a metric to evaluate the effect that taking longer to complete training has on LCDR promotion as an indication of overall performance.

Table 15. Descriptive Statistics of Months to Wing

VARIABLES	CASES	PERCENT	EXPECTATIONS
MTWING	4061	100	**STAY/PROMOTE**
FAST (<15)	1099	24.5	REFERENCE
AVERAGE (16-21)	2011	44.8	?
SLOW (22-36)	691	15.4	+/-
EARLY TRANSFER (37-60)	67	1.5	+ / +
LATE TRANSFER (>60)	22	.5	+ / -
NON-NFO	600	13.4	- /-

If the SNFO earns their wings in 15 months or less following commissioning, then the SNFO is considered "fast" and coded MTWING (0). If wings are earned in 16 to 21 months, the SNFO is considered "average" and coded MTWING (1). MTWING

(2), “slow,” earn their wings in 22 to 36 months. MTWING (3) is based on the expectation that an “early lateral transfer” occurred because the SNFO earned their wings in 36 to 60 months. A “late lateral transfer” occurs beyond 60 months.

This variable could appear biased against the longer training pipelines, however, the following three figures contain histograms that demonstrate how the respective communities compare to the timeline for months to wing. The NFOCMMTY variable is added to control for discrepancies in the MTWING variable across the major platform types. Figure 18 shows the percentage of CVN Jet NFOs relative to time to train for Figures 19 and 20 show Hawkeye and Maritime distribution. Most NFOs require sixteen to twenty-one months to earn their wings.

Figure 18. CVNJET vs. MTWING Histogram

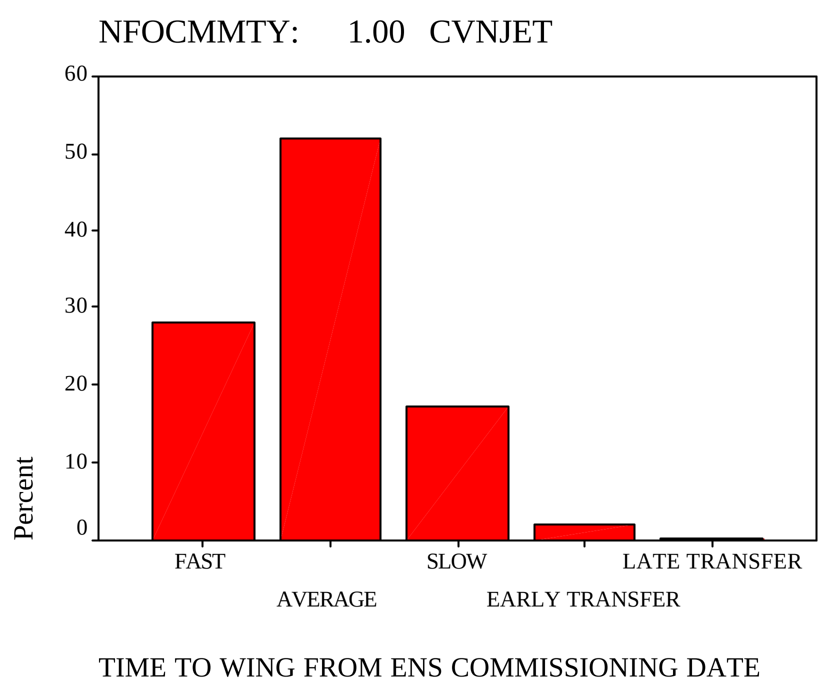


Figure 19. HAWKEYE vs. MTWING Histogram

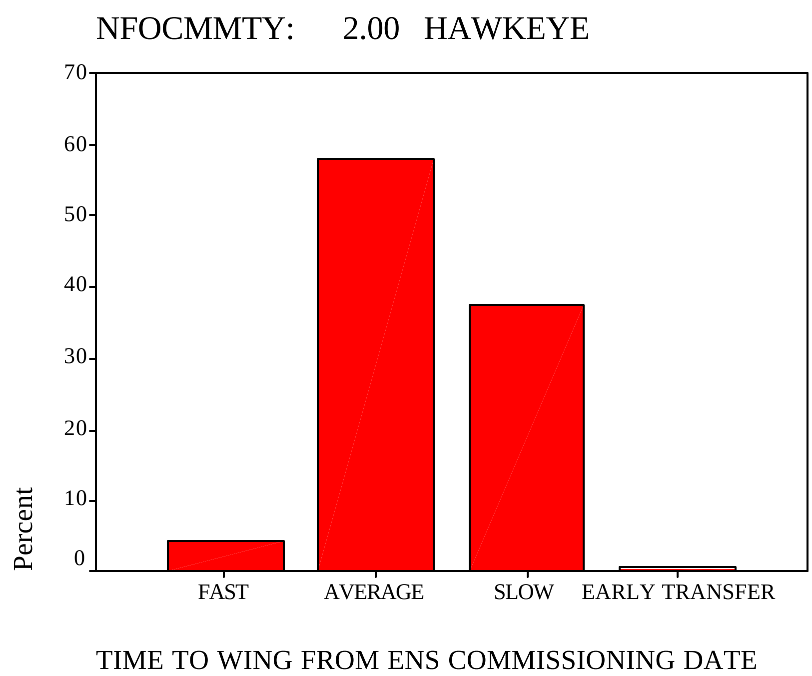
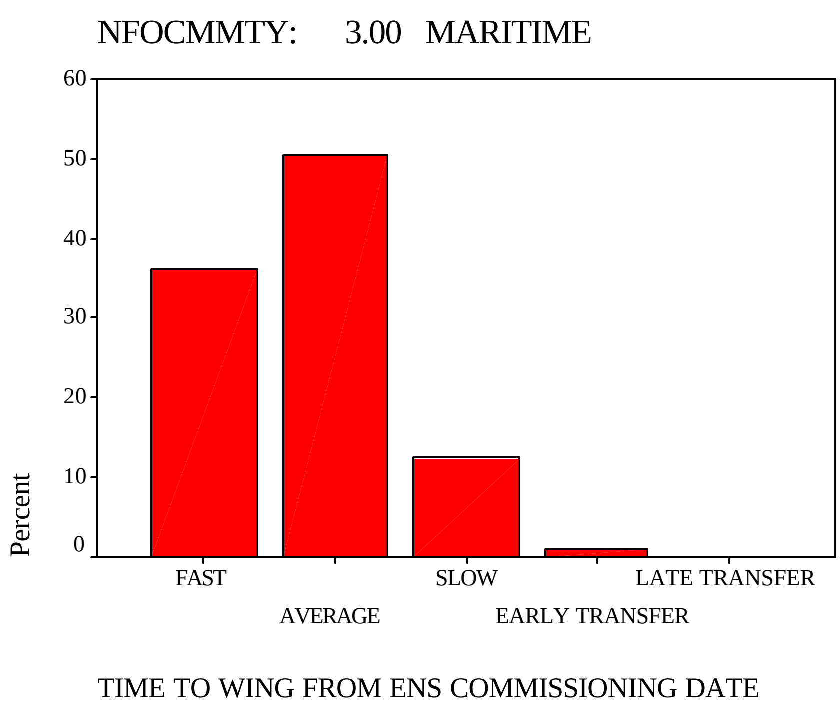


Figure 20. MARITIME vs. MTWING Histogram



NFOs that earn their wings the fastest are the reference group. Expectations for average NFOs are that there is no real difference between them and fast NFOs. For slow NFOs, the expectation is that they are more likely to remain as they started their MSR later than the fast NFOs. Slow NFOs experience delays either getting to or completing flight school. This delay indicates potential performance problems and therefore results in the expectations that slow NFOs are less likely to promote than fast NFOs. Both early and late transfer NFOs will be more likely to remain because these NFOs will probably still be serving their MSR at the time of LCDR promotion screening.

The expected difference is that early transfer NFOs will have had the opportunity to perform as a NFO prior to the LCDR promotion board, whereas late transfer NFOs will possibly be on their first sea tour developing their professional NFO reputation. For the SNFOs that fail flight school, the expectation is that a majority of these individuals will be disenfranchised with the U.S. Navy and seek gainful employment elsewhere as soon as possible. For those that remain, these non-NFOs will probably not promote as often as the seasoned NFO war-fighter that successfully completed training and mission objectives.

<u>Quality of NFO</u>. This independent variable is created to group NROTC and OCS naval officers into subgroups based on Barron's undergraduate college profile. QLTYNFO7 and QLTYNFO1 are developed from NFOSRC and BQEDU. NFOSRC and BQEDU values are incorporated into the variable QLTYNFOx. Thus, both NFOSRC and BQEDU are omitted from the three models due to redundancy.

QLTYNFO1 consists of eleven groups. This categorical independent variable allows a more refined examination of the impact education and commissioning sources have on NFOs. QLTYNFO1 has five subgroups for NROTC and OCS each. These five subgroups are associated with Barron's profile of colleges 1-2, 3, 4, 5-7, and Unknown.

The expectation for QLTYNFO1 is that all the other groups will have a negative value when compared to the reference value, USNA, because USNA represents quality training and the primary institution responsible for instilling in the 21st century naval officer the required U.S. Navy core values. This expectation places a greater emphasis on commissioning source than the BC value associated from the variable BQEDU.

Table 16. Descriptive Statistics of Quality of NFOs (QLTYNFO1)

VARIABLES	CASES	PERCENT	EXPECTATIONS
QLTYNFO1	4490	100	**WINGING/STAY/PROMOTE**
USNA	869	19.4	REFERENCE
NROTC BC1,2	402	9.0	?
NROTC BC3	462	10.3	-/-/-
NROTC BC4	347	7.7	-/-/-
NROTC 5,6,7	206	4.6	-/-/-
NROTC UNK	100	2.2	-/-/-
OCS BC1,2	179	4.0	-/-/-
OCS BC3	602	13.4	-/-/-
OCS BC4	634	14.1	-/-/-
OCS 5,6,7	360	8.0	-/-/-
OCS UNK	329	7.3	-/-/-

QLTYNFO7 consists of seven groups and applies when QLTYNFO1's refinement is not required. For example, QLTYNFO7 is applied to the retention and promotion models. QLTYNFO7 has three subgroups for NROTC and OCS each. These three subgroups are Barron's profile of 1-3, 4-7, and Unknown. Expectations for these groups of QLTYNFO7 are negative when compared to the reference group because of reasons similar to those noted above.

Table 17. Descriptive Statistics of Quality of NFOs (QLTYNFO7)

VARIABLES	CASES	PERCENT	EXPECTATIONS
QLTYNFO7	4490	100	**WINGING/STAY/PROMOTE**
USNA	869	19.4	REFERENCE
NROTC BC1,2,3	864	19.2	-/-/-
NROTC BC4,5,6,7	553	12.3	-/-/-
NROTC UNK	100	2.2	-/-/-
OCS BC1,2,3	781	17.4	-/-/-
OCS BC4,5,6,7	994	22.1	-/-/-
OCS UNK	329	7.3	-/-/-

B. BINOMIAL LOGIT MODELS

An initial model provides a base for developing three different binomial logit models used to answer the thesis questions. This initial binary model contains a dependent variable with two categories of independent variables. The independent variables categories are "Personal" and "Professional."

Using this premise, the appropriate variables are extracted from the data set discussed in the previous section. Personal independent variables include gender, ethnicity, age, dependent status, and undergraduate education. Professional independent variables include commissioning source, prior enlisted, aircraft community, graduate education, lateral transfer, and months to wing.

Personal Variables = *gender (GENDER) + minority (ETHNCGRP / MINORITY)+ age at time of commission (AGEGRP) + technical/non-technical major (NONTECH) + Barron's ranking of colleges (BQEDU) + dependent status (MARRYLT / HMARRYLC)*

Professional Variables = *commissioning source (NFOSRC) + prior enlisted (PRIORE) + platform community (NFOCMMTY) + graduate education (NGRDED) + lateral transfer (LATTRAN) + months to wing (MTWING)*

Having determined the independent variables for the analysis, the next step is to determine appropriate variables for the models. The first model examined is logically the one earliest in a NFO's career, the SNFO Completion of Training Model.

1. SNFO Completion of Training Model

Since NFOWING is the dependent variable for the training model, certain variables will not apply at this time. Time to train is an eventual outcome of this model, but not a factor at this time. Data on dependent status is from the LT promotion board, which is three years later for a majority of SNFOs. Graduate education is not considered because not enough SNFOs have graduate degrees; however, lateral transfers play a factor, particularly those that transferred into the community. Finally, NFO community is also omitted because the training phase will also determine that information. Thus, Figure 21 represents the resulting SNFO Completion of Training Model.

Figure 21. SNFO Completion of Training Model

NFOWING = f(gender (GENDER) + minority (ETHNCGRP / MINORITY)+ age at time of commission (AGEGRP) + technical/non-technical major (NONTECH)) + (Quality of Officer f(QLTYNFO = BQEDU + NFOSRC)) + prior enlisted (PRIORE) + transfer to NFO community f(TRNSTO =LATTRAN (1 +3)).

After having determined whether a SNFO became a NFO or not, it is necessary to develop a model regarding NFO Retention.

2. NFO Retention

Because LCDRSTAY is the dependent variable for the retention model, certain variables now apply. Initially, the same training model is used, but additional variables are added. Time to train and platform community are resultant variables of the NFOWING. Other data (e.g., dependent status, time to train, and platform community) are also relevant. Thus, the effects of marriage and children are examined. Graduate education is considered to see if that plays a role in determining retention. The TRNSTO variable is dropped and LATTRAN is added to account for the effect of attrition on training. All the other variables remain the same. Thus, Figure 22 shows the resultant NFO Retention Model.

Figure 22. NFO Retention Model

LCDRSTAY = f(gender (GENDER) + minority (ETHNCGRP / MINORITY)+ age at time of commission (AGEGRP) + technical/non-technical major (NONTECH) + ***dependent status (MARRYLT)*** *+ (Quality of Officer f(QLTYNFO = BQEDU + NFOSRC)) + prior enlisted (PRIORE) +* ***platform community (NFOCMMTY)*** *+* ***graduate education (NGRDED)*** *+* ***lateral transfer (LATTRAN)*** *+* ***months to wing (MTWING)****).*

Now that a model determining a value for NFO retention is established, what are the determinants of promotion for those retained? One more model, NFO LCDR Promotion, is necessary to reach a conclusion.

3. NFO LCDR Promotion

Because LCDRPROM is the dependent variable for the promotion model, only a few variables change. Initially, a prerequisite is required to be considered for promotion. That prerequisite is to retain from the previous model. Dependent status remains in the model; however, after five to six years, many dependent statuses change. This aspect is

accounted for by the variable HMARRYLC. All other independent variables remain the same. Figure 23 shows the resultant NFO LCDR Promotion Model.

Figure 23. NFO LCDR Promotion Model

LCDRPROMOTE = f(gender (GENDER) + minority (ETHNCGRP / MINORITY)+ age at time of commission (AGEGRP) + technical/non-technical major (NONTECH) + dependent status ***(HMARRYLC)*** *+ (Quality of Officer f(QLTYNFO = BQEDU + NFOSRC)) + (prior enlisted (PRIORE) + platform community (NFOCMMTY) + graduate education (NGRDED) + lateral transfer (LATTRAN) + months to wing (MTWING) +* ***LCDRSTAY(1).***

C. CHAPTER SUMMARY

This chapter described the variables, methodology, and three models used to evaluate the research questions. The dependent variables are divided into three categories for SNFOs training, NFOs retaining, and NFOs promoting to LCDR.

The personal independent variables include dichotomous and categorical variables that represent gender, ethnicity, age, undergraduate degree, quality of undergraduate institution, and dependent status. The professional independent variables also include dichotomous and categorical variables that represent commissioning sources, prior enlisted service, platform community, graduate education, lateral transfers, and months to train.

These models analyze whether SNFOs and transfer SNFOs will earn their wings, remain to LCDR promotion board, and actually promote to LCDR. Chapter V describes the results and analysis of the three models using binomial logit regression.

V. DATA RESULTS AND ANALYSIS

The results of three binomial logit models that analyze the determinants for NFOs earning their wings, retaining, and promoting to LCDR are reported in this chapter. These three models are statistically analyzed with "SPSS 10.0.7 for Windows."™ SPSS coding for the data and logit regression is included in Appendix A.

Case processing summaries and logit estimates for each model are provided in tables throughout this chapter. "Marginal effects" (ME)[16] are also included for each respective model's logit estimates. Results for each model are discussed in their respective sections. Following the NFO timeline, the first model examined is the training model with the NFOWING dependent variable.

A. TRAINING MODEL (NFOWING DEPENDENT VARIABLE)

This model[17] quantifies the independent variables and their effect on NFO training; 4,490 cases (100 percent) are used in the training and retention models. Table 18 shows the independent variables used in the training model along with their estimated coefficients and statistical significance levels. The logit coefficient, "B," is transformed into marginal effects (ME) that are evaluated at the mean level for all of the independent variables. For categorical variables, a negative "B" indicates a decreased likelihood that a SNFO would earn his wings compared to the omitted case. A positive "B" indicates that the variable is more likely to earn his wings than the reference or omitted case. The estimated probability difference is indicated by the ME value. The independent variables that are statistically significant at the .050 level are shown in bold print.

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[16] Appendix B contains additional information regarding ME.

[17] NFO training model's goodness-of-fit has 21 degrees of freedom with a Chi-square value of 245.344, a Significance value of .000, and a –2 Log likelihood of 3285.860.

Table 18. NFO Training Model Results

		B	Marginal Effects[b]	S.E.	Sig.
Step 1[a]	FEMALE	.276	.027	.369	.454
	CAUCASIAN (reference)				
	AFRCNAMRCN	**-.904**	**-.088**	.209	**.000**
	HISPANIC	-.570	-.056	.294	.053
	OTHER	.134	.013	.368	.715
	NON-TECHNICAL DEGREE	**-.277**	**-.027**	.101	**.006**
	AGE 20-22 (reference)				
	AGE 23-24	**-.327**	**-.032**	.123	**.008**
	AGE 25-26	**-.590**	**-.058**	.163	**.000**
	AGE 27-28	**-1.180**	**-.115**	.206	**.000**
	AGE 29+	**-1.569**	**-.113**	.278	**.000**
	PRIOR ENLISTED	**.417**	**.041**	.202	**.039**
	TRANSFER TO NFO	**1.974**	**.193**	.345	**.000**
	USNA (reference)				
	NROTC BC 1,2	**-1.063**	**-.104**	.217	**.000**
	NROTC BC 3	**-1.370**	**-.134**	.200	**.000**
	NROTC BC 4	**-1.600**	**-.156**	.207	**.000**
	NROTC BC 5,6,7	**-1.343**	**-.131**	.241	**.000**
	NROTC BC UNK	**-1.629**	**-.159**	.296	**.000**
	OCS BC 1,2	**-.573**	**-.056**	.291	**.049**
	OCS BC 3	**-.640**	**-.062**	.214	**.003**
	OCS BC 4	-.317	-.031	.224	.156
	OCS BC 5,6,7	-.192	-.019	.250	.442
	OCS BC UNK	**-.514**	**-.050**	.245	**.036**
	Constant	3.041		.164	.000

a. Bold highlighted independent variables and corresonding values indicated statisitcal significance to at least the .050 level.

b. Marginal effects evaluated at mean levels of all independent variables.

1. Personal Factors

Gender: Gender is not statistically significant. This result may, however, result because of small cell size (i.e. 98 percent of the SNFO population is male).

Race/Ethnicity: African-American SNFOs are shown to have the greatest difficulty in completing flight school. They are 8.8 percent less likely than Caucasians to earn their wings. This result is surprising and differs from the expectation of no

significant difference. Other ethnic groups are not shown to experience this degree of difficulty in flight school.

Nontech: It is estimated that SNFOs with non-technical degrees (e.g. business, social studies, humanities, political science, economics, and biology) have shown a 2.7 percent less likelihood of completing flight training than SNFOs with technical degrees (e.g. engineering, math, computer science, or physics). This result agrees with the expectation and is consistent with the technical curriculum of NFO flight school.

This result is noteworthy for two reasons. First, it supports a now-defunct officer recruiting program (NESEP) that paid for enlisted personnel's college expenses of those to earn a degree in either engineering (NESEP-A) or science (NESEP-B) for a six year period of obligation following commissioning. Second, this finding supports the current policy of giving greater weight to NROTC applicants who state their desire to earn a technical undergraduate degree.

Age: The results from the age variable are surprising. The older a SNFO is at the time of commissioning (23+), the less likely (–3.2 to –11.5 percent) the officer will complete NFO training than a 20 to 22 year old commissioned SNFO. These results differ from the expectation and are statistically significant. The expectation is that older officers with added experience will have a better idea of the steps required to achieve a desired goal, and therefore, more likely to succeed. However, these findings suggest, for example, that there may be a more arduous physical requirement in NFO flight training than previously expected as these results differ from expectations.

2. Professional Factors

Prior Service: As shown in Table 18, prior enlisted service members are 4.1 percent more likely to complete NFO training than non-prior enlisted service officers. This agrees with the expectation that prior enlisted sailors will know how to perform as required because they have already completed numerous U.S. Navy schools and therefore know how to succeed in the U.S. Navy training system. In addition to having already performed in Navy training commands, these officers could be more motivated as having

seen different facets of the U.S. Navy. Even though older SNFOs have trouble completing flight school, prior enlisted SNFOs experience improved success. Because most prior enlisted SNFOs would be part of the older age groups, this suggests that older SNFOs commissioned without prior experience have substantial problems with flight school. This may be attributed to older non-prior enlisted SNFOs not being as physically fit as their respective age group peers with prior enlisted experience.

<u>Transfer to SNFO</u>: Results in Table 18 show officers that laterally transfer to the NFO community are 19.3 percent more likely to have higher success rates than officers that initially started as a SNFO. The reason for this result could be related to the requirement that before officers are allowed to transfer to another URL community, they have to prove themselves in the fleet. Therefore, these officers exhibit a similar experience and motivation advantage as prior enlisted sailors show.

<u>Quality of NFO</u>: Table 18 shows that SNFOs from NROTC programs are 10.4 to 15.9 percent less likely to complete flight school than a USNA graduate. OCS SNFOs are 5.0 to 6.2 percent less likely to complete flight school when compared to USNA graduates. These results agree with expectations, as they should. USNA should have the best success rate as USNA graduates have the most naval training among the commissioning sources. The real surprise is the low success rate of NROTC graduates, particularly when compared to OCS graduates.

The previously mentioned expectation is that SNFOs from both OCS and NROTC would not perform as well as those from USNA; however, an unstated expectation is that NROTC SNFOs would perform better than OCS SNFOs. This expectation is because NROTC graduates should have more military exposure and naval training than the typical OCS graduates. This did not occur with this cohort. For example, among the various schools with NROTC programs, those from the most selective schools (BC 1 and 2) are 10.6 percent less likely to successfully complete training and earn their wings. While controlling for college selectivity, NROTC graduates are less likely to complete NFO training than OCS graduates from the same level of college selectivity.

In general, the results of Table 18 show OCS graduates from top 50 percent selective colleges (BC 1, 2, and 3) are roughly twice as likely to complete NFO training

(e.g.-5.6 percent less -10.4 percent , or +4.8 percent) than NROTC graduates. This differential is even greater from less selective colleges. An explanation is that perhaps OCS graduates are more motivated to become a NFO after having already paid their way through college via means other than the U.S. Navy.

In summary, the results of Table 18 shed light on the type of college graduate that the NFO community may want to target for future recruiting efforts if the U.S. Navy is interested in attracting graduates who are more likely to complete the expensive NFO training program. This includes:

- USNA graduates;
- technical degreed graduates;
- more OCS graduates and less NROTC graduates;
- and prior enlisted.

B. RETENTION MODEL (LCDRSTAY DEPENDENT VARIABLE)

Table 19 shows the NFO retention model[18] results for the likelihood an officer remains on active duty until being considered for promotion to LCDR (O-4). The same independent variables from the training model are used in the retention model along with several new independent variables. Additionally, this model also includes those SNFOs who attrited[19] from NFO training and redesignated. Noteworthy outcomes include that undergraduate degree and ethnicity are not significant factors in retention while gender, marriage, time to train, certain ages, certain academic programs, prior enlisted service, and lateral transfers are significant.

[18] NFO retention model's goodness-of-fit has 30 degrees of freedom with a Chi-square value of 337.537, a Significance value of .000, and a –2 Log likelihood of 5874.090.

[19] 600 of 4,490 naval officers failed to complete NFO training. Of those 600, 234 (39%) remained for the LCDR promotion board representing 9.9 percent of the 2,365 remaining sampled naval officers.

Table 19. NFO Retention Model Results

		B	Marginal Effect[b]	S.E.	Sig.
Step 1[a]	**FEMALE**	**-.492**	**-.122**	.234	**.035**
	MINORITY	-.005	-.001	.125	.967
	SINGLE LT/0 (reference)				
	SINGLE LT/1+	.595	.148	.457	.193
	MARRIED LT/0	.082	.020	.069	.235
	MARRIED LT/1	**.343**	**.085**	.116	**.003**
	MARRIED LT/2	.245	.061	.171	.152
	MARRIED LT/3+	**.702**	**.174**	.289	**.015**
	NON-TECHINCAL DEGREE	-.055	-.014	.068	.418
	AGE 20-22 (reference)				
	AGE 23-24	.054	.013	.084	.526
	AGE 25-26	.083	.021	.116	.474
	AGE 27-28	**.579**	**.144**	.166	**.000**
	AGE 29+	**.884**	**.219**	.259	**.001**
	PRIOR ENLISTED	**.451**	**.112**	.151	**.003**
	ALWAYS NFO (reference)				
	TRANSFER NFO	.095	.024	.129	.463
	SNFO ATTRITE	**-.682**	**-.169**	.118	**.000**
	TRANSFER SNFO ATTRITE	-.766	-.190	.715	.284
	NFO TRANSFERS	**1.328**	**.329**	.167	**.000**
	USNA (reference)				
	NROTC BC 1,2,3	-.098	-.024	.102	.335
	NROTC BC 4,5,6,7	.040	.010	.117	.732
	NROTC BC UNK	-.157	-.039	.226	.487
	OCS BC 1,2,3	**-.434**	**-.108**	.125	**.000**
	OCS BC 4,5,6,7	**-.333**	**-.083**	.126	**.008**
	OCS BC UNK	**-.355**	**-.088**	.157	**.024**
	CVN JET (reference)				
	HAWKEYE	*-.211*	-.052	.113	*.063*
	MARITIME	**-.315**	**-.078**	.074	**.000**
	UNK PLATFORM	.549	.136	1.078	.610
	MTWING (<15) (reference)				
	MTWING (15-21)	-.015	-.004	.086	.858
	MTWING (22-36)	**.354**	**.088**	.120	**.003**
	MTWING (37-60)	**2.128**	**.528**	.451	**.000**
	MTWING (>60)	4.382	1.087	2.841	.123
	Constant	.216		.119	.068

a. Bold highlighted independent variables and corresonding values indicated statisitcal significance to at least the .050 level.

b. Marginal effects evaluated at mean levels of all independent variables.

1. Personal Factors

Gender: This is the only model that found gender to be statistically significant. Females are 12.2 percent less likely to remain to the LCDR board than males. This would support Keegan's study regarding female naval aviation officers and their having a greater desire to leave the U.S. Navy to start families, for example. This result differs from the author's expectation that there would be no difference between men and women and suggests the U.S. Navy may need to investigate more thoroughly the quality of life for female NFOs.

Race/Ethnicity: Neither individual racial and ethnic groups nor their relative behavior as a collective group (MINORITY) are shown to have any significant influence on retention in the model. This may suggest that the fleet does not discriminate for or against any ethnic group. This differs from the expectation of higher retention rate for minority groups based on the expectation that DoD provides better equality of opportunity than the private sector. Perhaps private sector promotion opportunities for ethnic minorities are better than they may believe exist in the U.S. Navy today.

Dependent Status: Table 19 shows that being married with a child improve the probability that an officer will remain to the LCDR board by 8.5 percent as compared to a single NFO. This probability reaches +17.4 percent when the service member is married with three or more children as dependents. These findings agree with prior expectations and demonstrate how having a family will do two things. First, having a family will increase the importance of job security over potential pay increases from a private sector job. Second, having a larger family will increase the value of commissary, medical, and dental benefits to the service member.

Nontech: The importance of a technical degree diminishes over the six years that pass between flight school and the LCDR promotion board. The expectation is that a more technical person will perform NFO duties better and therefore enjoy the job more due to enhanced performance with a net result of higher retention. The results for this cohort do not justify this expectation. Even though an undergraduate major may indicate a NFO's interest, this interest does not drive career decisions at this point in a NFO's career.

Age: Age also plays a factor in retention. Older NFOs, those commissioned at the age of 27 or older, are 14.4 to 21.9 percent more likely to stay for the LCDR promotion board than an officer commissioned at age 20 to 22.. This agrees with expectations because these NFOs will probably be considering retirement more so than younger NFOs. A NFO that is commissioned at 27 years will be approximately 35 when actually able to decide to leave the naval service. With only an additional 12 years of naval service, a NFO would be eligible for retirement benefits and be 47 years old. Hence, the probability increases of 14.4 percent for that age group. Even older (29+) NFOs will be even more likely to remain with a corresponding probability increase of 21.9 percent.

2. Professional Factors

Prior Service: Table 19 shows that NFOs with prior enlisted service will be 11.2 percent more likely to stay than those without prior enlisted service. This is consistent with the expectation that prior enlisted would seek retirement as these officers have dedicated more time to their career, were older at the time of commissioning, and potentially already have a family in progress. Thus, prior enlisted personnel are to be more likely to complete NFO training and then more likely to stay to the LCDR board than non-prior enlisted personnel. One underlying factor behind this observation could be an increased level of motivation of prior-enlisted personnel.

Lateral Transfers: The lateral transfer's reference group is NFOs that never changed communities. By default, MSR ends prior to the LCDR promotion board. Most lateral transfers will earn their wings at least 36 to 48 months after being commissioned. Most lateral transfers' new MSR will extend beyond the LCDR promotion board. Therefore, these officers would be more likely to remain in service. This cohort does not confirm this expectation. This difference could be due to that many of the lateral transfers did so within three YOS. Those few officers who laterally transfer to the NFO community later were not numerous enough to be statistically significant.

However, this cohort did confirm that SNFOs who attrite are 16.9 percent less likely to stay in the service beyond their initial obligation. This could be a result of

failing to achieve their initial desire to fly for the U.S. Navy, which could cause SNFOs who attrite to be disenfranchised with the U.S. Navy.

From the results, one surprise is that NFOs who laterally transfer from the NFO community[20] are 32.9 percent more likely to remain in the U.S. Navy until the LCDR promotion than any other observed group. This large increase in probability for retention of NFOs who laterally transfer could be attributed to an increase in job satisfaction. Often these officers laterally transfer when they do not enjoy what they are doing or are no longer physically qualified.[21] Since these NFOs have already earned their wings, they have a degree of proficiency and time committed to the U.S. Navy. Even though these NFOs may not be happy with the NFO job or are no longer physically qualified for flight duty; instead of choosing to leave the U.S. Navy, they chose to remain and attempt a new job within the U.S. Navy.

<u>Quality of NFO</u>: USNA graduates confirm the expectation that they are the most likely to stay because of the screening tests during the application process followed by an intense indoctrination midshipmen receive during their four years at USNA. This differs from OCS graduates who are 8.3 to 10.8 percent less likely to remain for the LCDR promotion board than USNA graduates. OCS graduates are also less likely to stay compared indirectly to NROTC graduates; however, that result is not statistically significant. A possibility is that OCS graduates have the least indoctrination and time committed to naval service when compared to USNA and NROTC officers.

<u>Aircraft Type (Community Platform)</u>: This variable controls for the differences in aircraft type and Table 19 shows Maritime NFOs are 7.8 percent less likely to remain than CVN Jet NFOs. This result could be attributed to the large downsizing that had occurred in maritime aviation during the drawdown. Additionally, Maritime NFOs are more removed from the CVN battle group than those flying from a carrier. This could result in diminished job satisfaction.

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[20] This could occur to any NFO that earned their wings and chose to redesignate at some point after earning their wings.

[21] The author bases this on personal observations of Naval Avaition officers who laterally transferred during the author's 38 months assigned to a Naval Aviaiton squadron.

Time to Train: As shown on Table 19, the amount of time to train has a direct influence on NFO retention. The longer an individual takes to earn their wings, the closer the individual will be to the LCDR promotion board when completing their MSR for NFO training, and therefore more likely to stay. Hence, those NFOs that take 22 to 36 months to earn their wings are 8.8 percent more likely to stay and those NFOs that take 37-60 months to earn their wings are 52.8 percent more likely to stay than NFOs who earn their wings in 15 months or less.

In summary, the results of Table 19 shed light on the type of NFOs that are more inclined to retain:

- married officers with children;
- older NFOs;
- USNA and NROTC graduates
- and prior enlisted.

In addition to showing areas where additional retention efforts could be focused:

- females;
- single officers with no dependents;
- SNFOs who attrite from training;
- OCS graduates;
- and Maritime NFOs.

C. PROMOTION MODEL (LCDRPROM DEPENDENT VARIABLE)

The third, and final, model[22] presented in the study analyzes the LCDR promotion outcome, conditioned upon those naval officers[23] who decided to stay to the LCDR promotion board (near YOS = 10). Table 20 shows that 47.3 percent of the initial 4,490 cases are missing from the analysis. These missing cases are those naval officers that left the U.S. Navy between the Lieutenant and Lieutenant Commander selection boards (i.e. approximately between MSR and 10 YOS). Therefore, the promotion model is based upon 2,365 (52.7 percent) cases.

Table 20. NFO LCDR Promotion Model Case Processing Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	2365	52.7
	Missing Cases	2125	47.3
	Total	4490	100.0
Unselected Cases		0	.0
Total		4490	100.0

Table 21 shows the NFO LCDR Promotion model results. The only additional variable that is added to this model is graduate education. The dependent marital status variable is different in this model because approximately six years have passed between promotion boards. Noteworthy outcomes are that undergraduate degree and ethnicity are not significant factors while marriage, time to train, certain ages, and certain academic programs are significant.

[22] NFO promotion model's goodness-of-fit has 31 degrees of freedom with a Chi-square value of 96.072, a Significance value of .000, and a –2 Log likelihood of 2909.998.

[23] 234 SNFOs who attrited remained for the LCDR promotion board representing 9.9 percent of the 2,365 remaining sampled naval officers. 2,131 NFOs remained for the LCDR promotion board.

Table 21. NFO LCDR Promotion Model Results

		B	Marginal Effects[b]	S.E.	Sig.
Step 1[a]	FEMALE	.046	.010	.343	.894
	MINORITY	.075	.016	.183	.683
	SINGLE LT/0 (reference)				
	SINGLE LT/1+	-.073	-.016	.386	.850
	MARRIED LT/0	**.544**	**.119**	.134	**.000**
	MARRIED LT/1	**.601**	**.131**	.144	**.000**
	MARRIED LT/2	**.569**	**.124**	.138	**.000**
	MARRIED LT/3+	**.551**	**.121**	.184	**.003**
	NON-TECHICAL DEGREE	.025	.005	.099	.799
	AGE 20-22 (reference)				
	AGE 23-24	**-.262**	**-.057**	.125	**.037**
	AGE 25-26	**-.359**	**-.079**	.173	**.038**
	AGE 27-28	-.302	-.066	.229	.187
	AGE 29+	-.377	-.082	.300	.210
	PRIOR ENLISTED	.342	.075	.200	.088
	ALWAYS NFO (reference)				
	TRANSFER NFO	.176	.038	.175	.316
	SNFO ATTRITE	**-.594**	**-.130**	.183	**.001**
	TRANSFER SNFO ATTRITE	-1.567	-.343	1.247	.209
	NFO TRANSFERS	.434	**.095**	.181	.017
	USNA (reference)				
	NROTC BC 1,2,3	**-.359**	**-.079**	.143	**.012**
	NROTC BC 4,5,6,7	-.311	-.068	.162	.055
	NROTC BC UNK	-.128	-.028	.327	.695
	OCS BC 1,2,3	.121	.026	.190	.522
	OCS BC 4,5,6,7	-.179	-.039	.187	.338
	OCS BC UNK	-.309	-.068	.233	.184
	CVN JET (reference)				
	HAWKEYE	**.415**	**.091**	.167	**.013**
	MARITIME	-.073	-.016	.108	.500
	UNK PLATFORM	-.242	-.053	.626	.699
	MTWING (<15) (reference)				
	MTWING (15-21)	**-.356**	**-.078**	.131	**.007**
	MTWING (22-36)	**-.738**	**-.161**	.172	**.000**
	MTWING (37-60)	**-.868**	**-.190**	.321	**.007**
	MTWING (>60)	.726	.159	.806	.368
	GRADUATE DEGREE	-.115	-.025	.103	.266
	Constant	.857		.194	.000

a. Bold highlighted independent variables and corresonding values indicated statisitcal significance to at least the .050 level.

b. Marginal effects evaluated at mean levels of all independent variables.

1. Personal Factors

Gender/Ethnicity: As seen in Table 21, gender and ethnic minority status are not significantly related to promotion to LCDR. This suggests neither a positive nor a negative bias at the promotion boards, and the notion of the equality of opportunity that the DoD and U.S. Navy seek.

Dependent Status: Married with and without children improves (+11.9 to +13.1 percent) the probability that a NFO will promote to LCDR more so than a single NFO. This result agrees with the expectation and supports the theory that married men are more productive than single men. (Koreman and Neumark, 1990) Perhaps the single NFO is spending too much time seeking companionship and is not as focused at work as the married NFO.

Nontech: Table 21 shows that the type of undergraduate degree does not make a statistical difference in the promotion model. This could be because nine years that have passed since graduating college and whether a NFO studied engineering or economics is not very relevant to the professional warfighter who navigate aircraft, employ weapon systems, and solve personnel issues.

Age: These results from Table 21 are noteworthy. Contrary to the expectations, the older the NFO is, the less likely (–5.7 to-7.9 percent) the NFO will promote specifically those from the age 23 to 26. No significant results occur in this model for NFOs commissioned at age 27 or older. This result also diverges from the previous model where older NFOs are more likely to remain. A possibility is that this could be because these older commissioned officers are less "able" whereas they entered college later and/or took more time to complete the degree, and therefore are less productive than those who entered college directly and/or completed college sooner.

2. Professional Factors

Prior Service: Similar to undergraduate education, prior enlisted service does not significantly influence promotion boards. The lack of significance of this variable could

indicate that motivation or ability factors excluded from the model overwhelm the positive effect of added prior enlisted experience.

Quality of NFO: As seen by Table 21, NROTC NFOs from more selective colleges (BC 1, 2, and 3) schools are 7.9 percent less likely to promote to LCDR than USNA graduates. No other group has significant findings, resulting in the question as why this group is less likely to promote. One possibility is that due to “self-selection”, the NROTC NFOs from more selective schools remaining in naval service do not perform as well as those that left the naval service from that commissioning source group. As a collective whole, those NFOs represent simply the rest of more selective NROTC programs and not the best.

Lateral Transfers: From the promotion model, there is no bias for or against those officers that laterally transfer to the NFO community. SNFOs who attrite and chose to remain to the LCDR promotion board are 13.0 percent less likely to promote, which implies that those SNFOs who attrite still have questionable performance records even in a different warfare specialty. A noteworthy finding from the promotion model is that NFOs who transfer from the NFO community are 9.5 percent more likely to promote to LCDR than those NFOs that remain in the NFO community. This result is consistent with the high level of competence and competitiveness within the NFO community.

Aircraft Type (Community Platform): As seen in Table 21, Hawkeye NFOs are 9.1 percent more likely to be selected for LCDR than CVN Jet NFOs. This difference for promotion could be the result of the U.S. Navy rewarding Hawkeye NFOs for their hard work in an arduous job or an unobserved “ability premium” to those officers selecting this specialized platform .

Time to Train: Time to train significantly influences promotion. The longer NFOs take to earn their wings, the lower the probability (–7.8 to –19.0 percent) the individual will be selected for LCDR than the NFOs who earn their wings in less than 15 months. This result suggests that a direct correlation may exist between training performance and later operational fleet performance.

Officers that transfer to the NFO community have an extended training time (37-60 months) and are less likely (ME of –19.0) to promote to LCDR when compared to

officers that initially became NFOs. Referring to the lateral transfer variable, there is no significant difference between "transfer NFOs" and "always NFOs." That "no significant difference" result is probably due to this negative mean ME result that accounts "transfer NFOs." Transfer NFOs possibly promote less often than their peers do because they are behind their respective peer YG in the NFO community.

Graduate Degree: As seen in Table 21, acquiring a graduate degree has no significant effect on promotion to LCDR. This result does not support the occasional Junior Officer (JO) lore that getting a master's degree will hurt an officer's career, at least at the LCDR promotion board. Phillips' (2001) study showed a positive correlation of between graduate education and promotion to CDR and selection for command; however, these results indicate that the benefits of graduate education do not manifest for most NFOs in promoting to LCDR. The fact that graduate education is not a factor may also support JO lore that suggests that how an officer performs during his first sea tour be the primary determining factor in promotion to LCDR.

In summary, the results of Table 21 illuminate the type of NFOs that are more likely to promote:

- Younger (less than 23 years old at the time of commissioning) married officers with/without children;
- USNA and OCS graduates;
- NROTC graduates from less selective schools;
- and those that complete NFO training the fastest.

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VI. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY AND CONCLUSIONS

The primary goal of this thesis is to examine the determinants of successful junior NFO career progression as measured by completion of NFO training, retention of NFOs to the LCDR promotion board, and finally, promotion to LCDR. To aid in this examination, a determination of undergraduate educational background and time required to earn wings is important when identifying indicators of a higher quality naval officer.

Results show that the amount of training time NFOs require to earn their wings may reflect their overall performance. This is evident for those who remain to the LCDR promotion board and are promoted. The longer it takes a NFO to earn wings following commissioning, the less likely (ME of –7.8 to –19.0 percent) the NFO will promote. Because training time is a significant factor, successfully completing flight school is key for long-term success as a NFO. Regarding success in flight school, both NROTC (ME of –10.4 to -15.9 percent) and OCS graduates (ME of –5.6 to –6.2 percent) have a more difficult time completing flight school than USNA graduates. Overall, the success of USNA graduates could be attributed to USNA's very selective admissions screening process in addition to the training received in Bancroft Hall over four years at the U.S. Naval Academy.

Surprisingly, high quality (from most selective colleges) NROTC graduates appear to have the greatest problems promoting (ME of –7.9 percent) after already having had substantial difficulty (ME of –10.4 percent) completing flight school eight years earlier. Using mean values (Training at 86.6 percent, Retention at 53.0 percent, and Promotion at 67.0 percent from Table 1, Chapter IV) and applying the mean values ME to the two corresponding values for this NROTC case, the probability that high quality NROTC graduates become NFOs, remain, and promote to LCDR is 23.9 percent[24] as compared to mean 30.8 percent[25] for the whole dataset of NFOs.

[24] Using (.866-.104)= .762 and (.670-7.9)=.591 results in (.762 * .530 * .591) = .239

[25] (.866 * .530 * .670) = .308.

Difficulty completing flight school is further exacerbated if the NROTC SNFO is an African-American. This model shows that African-Americans are 8.8 percent less likely to complete flight school. The mean probability of an African-American NROTC graduate completing flight school, remaining, and promoting to LCDR is only 21.1 percent.[26]

Another question related to the quality of naval officers that is examined is "Are higher quality commissioned officers more likely to remain as NFOs?" USNA graduates are the metric by which all other sources are compared. To be considered a quality NFO, the first professional accomplishment of a NFO's career will be completing flight school. Certain factors increase this probability of success. SNFOs with technical degrees and prior enlisted experience are 2.7 and 4.1 percent, respectively, more likely to complete flight school. Successfully completing flight school in a timely manner indicates an overall performance characteristic that relates to promotion to LCDR. The more time required to earn wings, the lower the probability to promote to LCDR (–7.8 to –19.0 percent).

One of the secondary goals of this thesis is to determine the effects of lateral transfers in the NFO community. The results indicate that successfully earning a warfare designator prior to a lateral transfer will improve the probability of promotion; however, lateral transfers to the NFO community are less likely to promote due to the time to train variable. Most lateral transfers earn their wings in 37 to 60 months and are 19 percent less likely to promote. Winged NFOs that transfer to a different community are more likely (ME of +9.5) to promote to LCDR than their former NFO peers. Only 3.2 percent[27] of SNFOs who attrite from flight school will retain and promote to LCDR as SNFOs who attrite have both a lower likelihood of retention (ME of –16.9 percent) and a reduced (ME of -13.0 percent) probability of LCDR promotion. The SNFO who earns a naval commission via high quality NROTC program and fails to complete flight school has even lower probability of promoting to LCDR (overall probability of 2.7 percent).[28]

[26] Using (.866-.104-.088=.674), (.530) and (.670-.079 =.591) results in (.674*.530*.591) = .211.

[27] Using (1-.844 =.156), (.530-.169=.361), and (.670-.109=.561) results in (.156*.361*.561) = .032.

[28] Using (1-.844=.156), (.530-.169=.361), and (.670-.109-.079=.482) results (.156*.361*.482) =.027.

The study also examines the question, "How does NFO platform selection affect retention and LCDR promotion?" The Maritime program is the quickest training pipeline and the Hawkeye program is the slowest training pipeline. As a result, Maritime NFOs are 7.8 percent less likely to remain and Hawkeye NFOs are 9.1 percent more likely to promote. The net result is that platform type controls the disparity in the time required to earn wings from different programs. These results allow the Time to Train factor results to be accurate regardless of the platform.

For example, using the mean values and a training time of 15-21 months to earn NFO wings for each platform and holding all other variables constant, the following probabilities results occur for completion of winging, retaining, and promoting to LCDR:

- CVN Jet NFOs are 27.2 percent.[29]
- Hawkeye NFOs are 31.3 percent.[30]
- Maritime NFOs are 23.2 percent.[31]

However, taking into account that a majority of CVN NFOs, Hawkeye NFOs, and Maritime NFOs earn their wings average (15-21 months), slow (22-36 months), and fast (<15 months), respectively (referring to Figures 18, 19, and 20 from Chapter IV), the modified probabilities of completion of winging, retaining, and promoting to LCDR become:

- CVN Jet NFOs are still 27.2 percent.[29]
- Hawkeye NFOs are now 27.5 percent.[32]
- Maritime NFOs are now 26.2 percent.[33]

Thus, there seems to be no substantial difference in career progression rates across platform type once time to train is factored into the equation. If, however, NFOs

[29] Using (.866), (.530), and (.670 - .078 = .592) results in (.866 * .530 * .592) = .272.

[30] Using (.866), (.530), and (.670 - .078 + .091 = .683) results in (866 * .530 * .683) = .313

[31] Using (.866), (.530 - .078 = .452), and (.670 - .078 = .592) results in (.866 * .452 * .592) = .232.

[32] Using (.866), (.530), and (.670 - .161 + .091 = .600) results in (866 * .530 * .600) = .275

[33] Using (.866), (.530 - .078 = .452), and (.670) results in (.866 * .452 * .670) = .262.

earn their wings slower than average, there is an indication that this would indicate an overall below average performance.

B. FUTURE RESEARCH RECOMMENDATIONS

Further analysis is recommended for six subject areas: USNA, NROTC, race/ethnicity, effects of marriage, older NFOs, and children. These six areas generate several questions for future research.

USNA: With the overall higher success rate of USNA graduates in NFO flight school, retention, and promotion over other sources, a question arises as to why there are not more NFOs being chosen from the U.S. Naval Academy?

Only 88 USNA graduates became SNFOs in 2002. (USNAAA 2002) The average number per year of USNA graduates from the 1983 to 1990 classes in the dataset who initially selected NFO is 98. A difference of ten SNFOs may not seem that large, however when the combined probability of an U.S. Naval Academy graduate to complete flight school, retain and promote is 36.9 percent[34], it is.

For example, if this happens two consecutive years in a row, e.g. 2002 and 2003, then combined, that would be 20 less USNA graduates who enter the NFO pipeline. Those 20 USNA SNFOs would provide 19 winged NFOs in the fleet, which 11 of the 19 would stay for the LCDR promotion board and seven would be selected for promotion. Seven USNA LCDR NFOs would be available for assignments in the fleet at approximately 2012 and 2013.

Of course, it is possible to counter one accession source decrease through another accession source increase. Continuing with the example, to have those seven LCDR NFOs 10 years later, the U.S. Navy would need to recruit 30 additional NROTC SNFOs[35] over two years, or an additional 15 per year. The net result of this type of solution is that there are more SNFOs in the training pipeline, which would require either additional instructors or a longer training time for SNFOs.

[34] Using notional values determined in Tables 25, 29, and 33 in Appendix C, .954*.554*.699 = .369.

[35] Using the same probability numbers as used in Footnote 24 and working backwards from the required 7, (7 / .591 = 11.8), (12 / .530 = 22.6), and (23 / .762 = 30.2).

NROTC: Why are there significant differences between NROTC and OCS graduates within the NFO training pipeline? OCS graduates are more likely to succeed in flight school than NROTC graduates are from the same university or college quality. This seems to contradict expectations and suggests that NROTC may not provide a very cost-effective source pool for NFOs. Further exacerbating the cost-effectiveness of NROTC programs is the question of why are retained officers from highly selective NROTC colleges the least likely to be selected for LCDR promotion.

Race/Ethnicity: Why are African-Americans having difficulties in flight school? For YG 1983 to 1990, this problem is limited to flight school and did not continue with retention or promotion. During this time:

- USNA accessioned 20 (14.1 percent) African-Americans SNFOs.
- NROTC accessioned 25 (17.6 percent) African-Americans SNFOs.
- OCS accessioned 97 (68.3 percent) African-Americans SNFOs.

Of those 136, 106 (77.9 percent)[36] African-Americans earned their wings. Why are African-American SNFOs from NROTC programs having the greatest difficulty in flight school? Of those 106:

- 18 (90.0 percent)[37] of 20 USNA African-Americans earned their wings.
- 14 (56 percent)[38] of 25 NROTC African-Americans earned their wings.
- 74 (76.2 percent)[39] of 97 OCS African-Americans earned their wings.

Effects of Marriage: A noteworthy result from this study is that a married NFO with and without children has a greater probability to retain and promote than a single NFO. Why does marriage have a positive impact on LCDR promotion? Is this positive impact the result of increased productivity of married personnel? Or, is this the result of discrimination toward single sailors? It is clear that married NFOs are more likely to promote to LCDR by 10 percent.

[36] 3648 (87.1 percent) of 4187 Caucasians earned their wings.

[37] 769 (94.9 percent) of 810 USNA Caucasians earned their wings

[38] 1196 (82.8 percent) of 1445 NROTC Caucasians earned their wings

[39] 1683 (87.1 percent) of 1932 OCS Caucasians earned their wings.

<u>Older NFOs</u>: Older NFOs are less likely to earn wings, more likely to stay, and less likely to promote. A majority of older NFOs earns their commission via OCS. Is this a case of age or commissioning source discrimination? Is flight school still as physically demanding today as it was from 1984 to 1990? Why are older NFOs more likely to remain in the service longer but less likely to promote? Is this trend characteristic for other warfare communities as well?

<u>Children</u>: Children at pre-school and early grade school age may require more time from a NFO during the NFO's first sea tour and is the result of the combined effects of dependent marriage status and age variables. The premise of this hypothesis is that older NFOs are further along in building a family and age variable is considering that factor. Older, married NFOs would probably have more children who are older and more of a factor during the NFO's first sea tour. Specifically, the age of the children during the NFO's first sea tour could be the driving factor in the age variable.

For example, two different NFOs were married at 21 years old. Two years after getting married, the first child arrives followed by a second child two years later. The difference between these NFOs is that one was commissioned at 21 and the other is commissioned at 26. The 21-year old NFO will have a 7-year old and a 5-year old at the time of the LCDR promotion board. The 26-year old NFO will have a 12-year old and a 10-year old at the time of the LCDR promotion board. The first sea tour occurs seven (check-in with the squadron) to four (checkout of the squadron) years prior to the LCDR promotion board convening. The 21-year old NFO will have a 3-year old and a 1-year old by the end of his first sea tour. Whereas the 26-year old NFO will have an 8-year old and a 6-year old at the end of his first sea tour.

Having pre-school and grade school age children may affect a NFO's performance during the NFO's first sea tour. This could also explain why even older NFOs (27+) are not experiencing diminished promotion probabilities. Modifying the earlier scenario, change the age of the NFO to 29, the age of children are 11 and 9 years old at the end of his first sea tour. These children are becoming more self-sufficient requiring less time from the NFO. Is this hypothesis is true? If so, then what will the U.S. Navy do to help future NFOs in similar circumstances be more competitive for LCDR promotion?

APPENDIX A. SPSS CODING

1. BINOMIAL LOGIT REGRESSION

```
LOGISTIC REGRESSION VAR=nfowing
  /METHOD=ENTER gender ethngrp nontech agegrp5 priorser trnsto qltynfo1
  /CONTRAST (ethngrp)=Indicator(1)  /CONTRAST (agegrp5)=Indicator(1)
  /CONTRAST (qltynfo1)=Indicator(1)
  /CRITERIA PIN(.05) POUT(.10) ITERATE(20) CUT(.5) .

LOGISTIC REGRESSION VAR=lcbdstay
  /METHOD=ENTER gender minority marrylt nontech
agegrp5 priorser lattran qltynfo7 nfocmmty mtwing
  /CONTRAST (marrylt)=Indicator(1)  /CONTRAST (agegrp5)=Indicator(1)
  /CONTRAST (lattran)=Indicator(1)  /CONTRAST (qltynfo7)=Indicator(1)
  /CONTRAST (nfocmmty)=Indicator(1)  /CONTRAST (mtwing)=Indicator(1)
  /CRITERIA PIN(.05) POUT(.10) ITERATE(20) CUT(.5) .

LOGISTIC REGRESSION VAR=lcdrprom
  /METHOD=ENTER gender minority hmarrylc nontech
 agegrp5 priorser lattran qltynfo7 nfocmmty mtwing nfogrded
  /CONTRAST (hmarrylc)=Indicator(1)  /CONTRAST (agegrp5)=Indicator(1)
  /CONTRAST (lattran)=Indicator(1)  /CONTRAST (qltynfo7)=Indicator(1)
  /CONTRAST (nfocmmty)=Indicator(1)  /CONTRAST (mtwing)=Indicator(1)
  /CRITERIA PIN(.05) POUT(.10) ITERATE(20) CUT(.5) .
```

2. SPSS SYNTAX

```
/********************
/ ***NFO PLATFORM COMMUNITY
/********************
STRING NFOTOUR1 (A3).
STRING NFOTOUR2 (A3).
COMPUTE NFOTOUR1=SUBSTR (ds1title,1,3).
COMPUTE NFOTOUR2=SUBSTR (ds2title,1,3).
RECODE NFOTOUR2 ('   '='XXX').
STRING NFODTOUR (A3).
COMPUTE NFODTOUR=SUBSTR (ds1title,7,3).
IF (NFODTOUR = 'ING') NFOCMMTY = 1.
IF (NFODTOUR = 'G 6') NFOCMMTY = 1.
IF (NFODTOUR = '/CR') NFOCMMTY = 1.
IF (NFODTOUR = 'AW ') NFOCMMTY = 2.
IF (NFODTOUR = 'HCO') NFOCMMTY = 2.
IF (NFODTOUR = 'NAV') NFOCMMTY = 3.
IF (NFODTOUR = ' PN') NFOCMMTY = 3.
IF (NFODTOUR = 'COL') NFOCMMTY = 3.
IF (NFODTOUR = 'TRA') NFOCMMTY = 3.
STRING NFO1 (A1).
STRING NFO2 (A1).
COMPUTE NFO1=SUBSTR (ds1title,1,1).
COMPUTE NFO2=SUBSTR (ds2title,1,1).
COMPUTE NFOSQ=0.
IF (NFO1='V') NFOSQ=1.
IF ((NFOSQ=0) AND (NFO2='V')) NFOSQ=2.
STRING NFOSQDRN (A3).
IF (NFOSQ=1) NFOSQDRN=NFOTOUR1.
IF (NFOSQ=2) NFOSQDRN=NFOTOUR2.
EXECUTE.

DO IF (NFOSQ=0).
IF (NFOTOUR1='S C') NFOSQDRN=NFODTOUR.
END IF.

RECODE NFOSQDRN ('VA ','VAQ','VF ','VFA','VS '=1)('VAW'=2)('VP ','VQ
','VPU','VXE','VXN','VR ','VRC'=3) INTO NFOCMMTY.
EXECUTE.

DO IF (NFODESYR<83).
IF (NFODESYR<83) NFOCMMTY=5.
END IF.

RECODE NFODESYR (SYSMIS=5) INTO NFOCMMTY.
VAR LABELS NFOCMMTY PLATFORM COMMUNITY.
VALUE LABELS NFOCMMTY (5)NONNFO (1)CVNJET (2)HAWKEYE (3)MARITIME.
EXECUTE.

/*********************
/ NFO WING BINARY VARIABLE
/*********************
COMPUTE NFOWING = 0.
IF (NFODESYR>82) NFOWING=1.
EXECUTE.

/*******************
/* LT DATA ELEMENTS: PLANE TYPE
/*******************
do repeat var=aqd1 to aqd12.
recode var ('DA1','DA2','DA4','DA6','DA7','DA0'=1)
```

```
  ('DB2','DB3','DB4','DB6','DB0','DC4','DD2'=1)
  ('DD3','DD4','DD6','DD7','DD8','DG5','DG6','DG7','DG8','DG9','E1'=1) into
CVNJET.
end repeat.
do repeat var=aqd1 to aqd12.
recode var ('DL3','DL0','DT7'=1) into HAWKEYE.
end repeat.
do repeat var=aqd1 to aqd12.
recode var ('DJ3','DJ4','DJ0','DK2','DK5','DK0'=1)
  ('DM0','DN2','DP1','DP2','DP8'=1)
  ('DQ4','DQ5','DR0','DS2','DS0','DT6'=1) into MARITIME.
end repeat.
RECODE CVNJET (sysmis = 0).
RECODE HAWKEYE (SYSMIS = 0).
RECODE MARITIME (SYSMIS = 0).
COMPUTE NFOTYPE = CVNJET + HAWKEYE + MARITIME
IF (CVNJET = 1) NFOTYPE = 1.
IF (HAWKEYE = 1) NFOTYPE = 2.
IF (MARITIME = 1) NFOTYPE = 3.
IF (NFOTYPE = 0) NFOTYPE = 0.
var labels NFOTYPE TYPE CODE AT LT BOARD.
value labels NFOTYPE (0) NONE (1)CVNJET (2)HAWKEYE (3)MARITIME.
EXECUTE.

/*********************
/* COMBINE PLATFORM WITH AQD TO GET MAXIMINE COMMUNITY
/*********************
RECODE NFOCMMTY (SYSMIS = 999).
IF ((NFOCMMTY=999) AND (NFOWING=1) AND (NFOTYPE>0)) NFOCMMTY = NFOTYPE.
IF ((NFOCMMTY=5) AND (NFOWING=1) AND (NFOTYPE>0)) NFOCMMTY = NFOTYPE.
EXECUTE.

DO IF (NFOCMMTY=999).
IF ((HDESIG NE 1320) OR (HDESIG NE 1325)) NFOCMMTY = 4.
VALUE LABELS NFOCMMTY (5)NONNFO (1)CVNJET (2)HAWKEYE (3)MARITIME (4) UNKNOWN.
END IF.

/*********************
/ NFO AND SNFO LATERAL TRANSFERS
/*********************
IF ((INITDES = 4 OR INITDES = 8) AND (BDDESIG = 4 AND NFOWING =1))LATTRAN = 0.
IF ((INITDES = 4 OR INITDES = 8) AND (BDDESIG NE 4 AND NFOWING =1))LATTRAN = 4.
IF((INITDES=4 OR INITDES=8) AND(BDDESIG=4 AND HBDDESIGNE4) AND(NFOWING=1))
 LATTRAN=4.
IF ((INITDES NE 4 AND INITDES NE 8) AND (BDDESIG =4 AND NFOWING =1))LATTRAN =1.
IF ((INITDES NE4 AND INITDES NE8) AND (BDDESIG NE4 AND HBDDESIG =4))LATTRAN =1.
IF ((INITDES =4 OR INITDES =8) AND (BDDESIG NE 4 AND NFOWING = 0)) LATTRAN = 2.
IF ((INITDES = 4 OR INITDES = 8) AND (BDDESIG = 4 AND NFOWING = 0)) LATTRAN =2.
IF ((INITDES NE 4 AND INITDES NE 8) AND (BDDESIG NE 4 AND NFOWING = 0))
 LATTRAN = 3.
IF ((INITDES NE 4 AND INITDES NE 8) AND (BDDESIG =4 AND NFOWING =0))LATTRAN =3.
IF ((INITDES NE 4 AND INITDES NE 8) AND (NFOWING = 0 AND HBDDESIG NE 4))
 LATTRAN = 3.
EXECUTE.
VAR LABELS LATTRAN LATERAL TRANSFERS.
VALUE LABELS LATTRAN (0)ALWAYS NFO (1) TRANSFER NFO (2)  SNFO ATTRITE
 (3) TRANSFER SNFO ATTRITE (4) NFO TRANSFER .
EXECUTE.
```

```
/*********************
/ SNFO LATERAL TRANSFERS)
/*********************
COMPUTE TRNSTO = 0.
IF ((LATTRAN=1) OR (LATTRAN=3)) TRNSTO = 1.
VAR LABELS TRNSTO LATERAL TRANSFER TO NFO.
VALUE LABELS TRNSTO (0) INITAL NFO (1) TRANSFER NFO.
EXECUTE.

/*********************
/ NFO TIME TO WING
/*********************
IF (ACBD_YR = 0) ACBD_YR = DORO1YR.
IF (ACBD_MO = 0) ACBD_MO = DORO1MO.
IF (NFOWING=1) MOSWING = ((NFODESYR-ACBD_YR)*12+(NFODESMO-ACBD_MO)).
EXECUTE.

RECODE MOSWING (SYSMIS=999).
IF (MOSWING < 15) MTWING = 0.
IF ((MOSWING > 14) AND (MOSWING < 22)) MTWING = 1.
IF ((MOSWING > 21) AND (MOSWING < 37)) MTWING = 2.
IF ((MOSWING > 36) AND (MOSWING < 61)) MTWING = 3.
IF (MOSWING > 60) MTWING = 4.
IF (MOSWING = 999) MTWING=5.
VAR LABELS MTWING TIME TO WING FROM ENS COMMISSIONING DATE.
VALUE LABELS MTWING (0) FAST (1) AVERAGE (2) SLOW (3) EARLY TRANSFER
 (4) LATE TRANSFER (5) NON-NFO.
EXECUTE.

/**********************************************
/**MARRIAGE-CHILDREN CODING: LT & LC BOARDS
/**********************************************
RECODE PRIDEP ('0'=1)('1','K'=3)('A','B','C','D','E'=2)('2','S'=4)('3','T'=5)
   ('4','5','6','7','8','9'=6)('S','T','U','V','W'=6) INTO MARRYLT.
VAR LABELS MARRYLT MARRYLT:Marriage Status at 03 Board.
VALUE LABELS MARRYLT (1)SNGLDIV0 (2)UNMARRD1+ (3)MARRD0 (4)MARRD1 (5)MARRD2
(6)MARRD3+.
RECODE PRIDEP ('K','S','T','U','V','W'=1)(ELSE=0) INTO MLSPSELT.
VAR LABELS MLSPSELT MILSPSELT: Military Spouse Indicator.
VALUE LABELS MLSPSELT (0)NO (1)YES.
EXECUTE.

RECODE HPRIDEP ('0'=1)('1','K'=3)('A','B','C','D','E'=2)('2','S'=4)('3','T'=5)
   ('4','5','6','7','8','9'=6)('S','T','U','V','W'=6) INTO HMARRYLC.
VAR LABELS HMARRYLC HMARRYLC:Marriage Status at 04 Board.
VALUE LABELS HMARRYLC (1)SNGLDIV0 (2)UNMARRD1+ (3)MARRD0 (4)MARRD1 (5)MARRD2
(6)MARRD3+.
RECODE HPRIDEP ('K','S','T','U','V','W'=1)(ELSE=0) INTO HMLSPSLC.
VAR LABELS HMLSPSLC HMLSPSLC: Military Spouse Indicator.
VALUE LABELS HMLSPSLC (0)NO (1)YES.
EXECUTE.

/**********************************************
/**SINGLE LT WITH NO DEPENDENTS
/**********************************************

IF (MARRYLT = 1) SNGLNFO = 1.
IF (MARRYLT > 1) SNGLNFO = 0.
VAR LABELS SNGLNFO DEPENDENT STATUS AT 03 NFO BOARD.
VALUE LABELS SNGLNFO (1)WITHOUT ANY DEPENDENTS (0)WITH DEPENDENTS.
EXECUTE.
```

```
/**********************************************
/**DIFFERENT GROUPINGS OF DEPENDENTS FOR MARRYLT
/**********************************************

IF (MARRYLT = 1) MARRYLT1 = 0.
IF (MARRYLT = 2 OR MARRYLT =3) MARRYLT1 = 1.
IF (MARRYLT >2) MARRYLT1 = 2.
VAR LABELS MARRYLT1 DEPENDENT STATUS AT 03 NFO BOARD.
VALUE LABELS MARRYLT1 (0) WITHOUT ANY DEPENDENTS (1) WITH 1 DEPENDENT
 (2) MARRIED WITH DEPENDENTS.
EXECUTE.

/**********************
/**COLLEGE SELECTIVITY CODE
/**********************
IF ((BARRONS = 1) OR (BARRONS = 2)) BQEDU = 1.
IF (BARRONS = 3) BQEDU = 2.
IF (BARRONS = 4) BQEDU = 3.
IF ((BARRONS = 5) OR (BARRONS = 6) OR (BARRONS = 7)) BQEDU = 4.
IF (SOURCE=1) BQEDU = 0.
RECODE BQEDU (SYSMIS=5).
VAR LABELS BQEDU College Selectivity Code.
VALUE LABELS BQEDU (0)ACADEMY (1)MOST AND HIGHLY (2)VERY (3)SELECTIVE
 (4)LESS, NON AND NEC.
EXECUTE.

IF (SOURCE=1) BARRONS=0.
VAR LABELS BARRONS BARRONS College Selectivity Code.
VALUE LABELS BARRONS (0)ACADEMY (1)MOST (2)HIGHLY (3)VERY (4)SELECTIVE (5)LESS
(6)NON (7)NEC.
EXECUTE.

/**********************
/**COMBINING NFO SOURCE CODES
/**********************
IF (SOURCE = 1) NFOSRC = 1.
IF ((SOURCE = 2) OR (SOURCE = 3)) NFOSRC = 2.
IF (SOURCE = 4) NFOSRC = 3.
IF ((SOURCE = 5) OR (SOURCE = 99)) NFOSRC = 3.
VAR LABELS NFOSRC ACCESSION SOURCE.
VALUE LABELS NFOSRC (1)ACADEMY (2)NROTC (3)OCS.
EXECUTE.

/**********************
/**COMBINING ETHNICITY GROUPS
/**********************
IF (ETHNCITY = 1) MINORITY = 0.
IF ((ETHNCITY = 2) OR (ETHNCITY= 3) OR (ETHNCITY = 4) OR (ETHNCITY=5) OR
(ETHNCITY = 6)) MINORITY = 1.
VAR LABELS MINORITY MINORITIES.
VALUE LABELS MINORITY (0)WHITE (1)ETHNIC MINORITY.
EXECUTE.

/**********************
/**COMBINING ETHNICITY GROUPS WITH GENDER
/**********************
IF (ETHNCITY = 1) MNRTYF = 0.
IF ((ETHNCITY = 2) OR (ETHNCITY= 3) OR (ETHNCITY = 4) OR (ETHNCITY=5) OR
(ETHNCITY = 6) OR (GENDER=1)) MNRTYF = 1.
VAR LABELS MNRTYF MINORITIES.
VALUE LABELS MNRTYF (0)WHITE MALE (1)ETHNIC AND GENDER MINORITIES.
EXECUTE.
```

```
/*********************
/**CREATING THREE AGE GROUPS
/*********************
IF ((AGECOMM = 20) OR (AGECOMM = 21) OR (AGECOMM=22)) AGEGRP3 = 1.
IF ((AGECOMM = 23) OR (AGECOMM = 24)) AGEGRP3 = 2.
IF (AGECOMM > 24) AGEGRP3 = 3.
VAR LABELS AGEGRP3 AGE GROUP AT COMMISSIONING.
VALUE LABELS AGEGRP3 (1) 20-22 (2) 23 AND 24 (3) 25+.
EXECUTE.

/*********************
/**CREATING FIVE AGE GROUPS
/*********************
IF ((AGECOMM = 20) OR (AGECOMM = 21) OR (AGECOMM=22)) AGEGRP4 = 1.
IF ((AGECOMM = 23) OR (AGECOMM = 24)) AGEGRP4 = 2.
IF ((AGECOMM = 25) OR (AGECOMM = 26)) AGEGRP4 = 3.
IF ((AGECOMM = 27) OR (AGECOMM = 28)) AGEGRP4 = 4.
IF (AGECOMM >28) AGEGRP4 = 5.
VAR LABELS AGEGRP4 AGE GROUP AT COMMISSIONING.
VALUE LABELS AGEGRP4 (1) 20-22 (2) 23 AND 24 (3) 25 AND 26 (4) 27
 AND 28 (5) 29+.
EXECUTE.

/*********************
/**CREATING UGRAD MAJOR GROUPS
/*********************
IF (UGMAJORS = 3)  NFOMAJOR = 1.
IF (UGMAJORS = 2) NFOMAJOR = 2.
IF ((UGMAJORS = 1) OR (UGMAJORS = 4)) NFOMAJOR = 3.
IF ((UGMAJORS = 5) OR (UGMAJORS = 6)) NFOMAJOR = 4.
IF ((UGMAJORS = 7) OR (UGMAJORS = 99)) NFOMAJOR = 5.
VAR LABELS NFOMAJOR UNDERGRAD MAJOR.
VALUE LABELS NFOMAJOR (1)ENGINEERING (2) PHYS SCI & MATH
 (3) BIO AND SOCIAL SCIENCES (4) BUSINESS, ECONOMICS, AND HUMANITIES
 (5) ALL OTHERS.
EXECUTE.

/*********************
/**CREATING UGRAD TECH AND NON-TECH  MAJOR GROUPS
/*********************
IF ((NFOMAJOR = 1) OR (NFOMAJOR = 2)) NFOMJRGP = 0.
IF (NFOMAJOR > 2) NFOMJRGP = 1.
VAR LABELS NFOMJRGP TECHNICAL AND NON-TECHNICAL MAJOR GROUPS.
VALUE LABELS NFOMJRGP (0)TECHNICAL (1)NON-TECHNICAL.
EXECUTE.

/*********************
/**CREATING SUBGROUPS BASED UPON  NFOSRC AND BQEDU (USNA, 5 NROTC, 5 OCS).
/*********************
IF ((NFOSRC = 1) AND (BQEDU = 0))QLTYNFO1 = 0.
IF ((NFOSRC = 2) AND (BQEDU = 1)) QLTYNFO1 = 1.
IF ((NFOSRC = 2) AND (BQEDU = 2)) QLTYNFO1 = 2.
IF ((NFOSRC = 2) AND (BQEDU = 3)) QLTYNFO1 = 3.
IF ((NFOSRC = 2) AND (BQEDU = 4)) QLTYNFO1 = 4.
IF ((NFOSRC = 2) AND (BQEDU = 5)) QLTYNFO1 = 5.
IF ((NFOSRC = 3) AND (BQEDU = 1)) QLTYNFO1 = 6.
IF ((NFOSRC = 3) AND (BQEDU = 2)) QLTYNFO1 = 7.
IF ((NFOSRC = 3) AND (BQEDU = 3)) QLTYNFO1 = 8.
IF ((NFOSRC = 3) AND (BQEDU = 4)) QLTYNFO1 = 9.
IF ((NFOSRC = 3) AND (BQEDU = 5)) QLTYNFO1 = 10.
EXECUTE.
```

```
VAR LABELS QLTYNFO1 SOURCE, BARRONS QLTY GROUPING AND UNDERGRAD MAJOR.
VALUE LABELS QLTYNFO1 (0)USNA  (1) NROTC BC1&2 (2) NROTC BC3 (3) NROTC BC4
 (4) NROTC BC5&6&7 (5) NROTC BC UNK (6) OCS BC1&2 (7) OCS BC3 (8) OCS BC4 (9)
OCS BC5&6&7 (10) OCS BC UNK.
EXECUTE.

/**********************
/**CREATING SUBGROUPS BASED UPON  NFOSRC AND BQEDU. (USNA, THREE ROTC, AND
THREE OCS GROUPS)
/**********************
IF ((NFOSRC = 1) AND (BQEDU = 0))QLTYNFO7 = 0.
IF ((NFOSRC = 2) AND (BQEDU = 1)) QLTYNFO7 = 1.
IF ((NFOSRC = 2) AND (BQEDU = 2)) QLTYNFO7 = 1.
IF ((NFOSRC = 2) AND (BQEDU = 3)) QLTYNFO7 = 2.
IF ((NFOSRC = 2) AND (BQEDU = 4)) QLTYNFO7 = 2.
IF ((NFOSRC = 2) AND (BQEDU = 5)) QLTYNFO7 = 3.
IF ((NFOSRC = 3) AND (BQEDU = 1)) QLTYNFO7 = 4.
IF ((NFOSRC = 3) AND (BQEDU = 2)) QLTYNFO7 = 4.
IF ((NFOSRC = 3) AND (BQEDU = 3)) QLTYNFO7 = 5.
IF ((NFOSRC = 3) AND (BQEDU = 4)) QLTYNFO7 = 5.
IF ((NFOSRC = 3) AND (BQEDU = 5)) QLTYNFO7 = 6.
EXECUTE.

VAR LABELS QLTYNFO7 SOURCE, BARRONS QLTY GROUPING AND UNDERGRAD MAJOR.
VALUE LABELS QLTYNFO7 (0)USNA  (1) NROTC BC1&2&3 (2) NROTC BC4&5&6&7 (3) NROTC
BC UNK
(4) OCS BC1&2&3 (5) OCS BC4&5&6&7 (6) OCS BC UNK.
EXECUTE.

/*************
/CODE TO ASSIGN A VALUE TO ALL OFFICERS FOR GRADED FOR O4
/***************
IF (HGRADED = 0) NFOGRDED = 0.
IF (HGRADED = 1) NFOGRDED = 1.
IF (HGRADED = 2) NFOGRDED = 1.
IF ((HGRADED = 3) OR (HGRADED = 4)) NFOGRDED = 1.
VAR LABELS NFOGRDED THREE TYPES OF GRADUATE EDUCATION.
VALUE LABELS NFOGRDED (0)NONE (1)GRADUATE DEGREE (2)UNKNOWN
EXECUTE.
```

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APPENDIX B. CALCULATION OF MARGINAL EFFECTS FROM LOGIT COEFFICIENTS

Marginal effects (ME) calculate the change in the probability of the dependent variables of "completing training," "staying to LCDR promotion board," or "promote to LCDR" for a unit change in each independent variable. Calculations of the ME for major covariates show the effects of the independent variables in logit regression. For a binomial logit model, each logit coefficients are the log of the odds of a "1" outcome for the dependent variables (NFOWING, LCDRSTAY, and LCDRPROM) while holding constant the other variables. Additional calculations are necessary to obtain ME for these independent variables. A four-step process determined these calculations. (Bowman, 2002)

(1) Calculated $Z = B_k * XBAR_k$ where:

B_k = logit coefficients for independent variable "k" and

$XBAR_k$ = intercept and mean values of independent variables.

(2) Calculated P (Y=1) = 1 / $(1+e^{-z})$.

(3) Calculated P (Y=0) = 1 - P (Y=1).

(4) Calculated the marginal effect, "delta", = $B_k * (P*(1-P))$.

These calculations are performed using Microsoft Excel™ and the results are displayed in the last column of Tables 22, 23, and 24 for NFOWING, LCDRSTAY, and LCDRPROM, respectively.

ME is also examined by changing certain variables resulting in a corresponding change in probabilities of the dependent variables. These notional ME are included in Appendix C (Tables 25 to 37). The base probabilities used initially in the notionals are derived from the models themselves.

Table 22. Probability to Complete NFO Training (NFOWING = 1)

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	3.041	3.041	
FEMALE	0.020	0.276	0.006	0.027
CAUCASIAN (reference)	0.933			
AFRCNAMRCN	0.032	-0.904	-0.029	**-0.088**
HISPANIC	0.018	-0.570	-0.010	-0.056
OTHER	0.017	0.134	0.002	0.013
NONTECH DEGREE	0.585	-0.277	-0.162	**-0.027**
AGE 20-22(reference)	0.494			
AGE 23-24	0.291	-0.327	-0.095	**-0.032**
AGE 25-26	0.133	-0.590	-0.078	**-0.058**
AGE 27-28	0.058	-1.180	-0.068	**-0.115**
AGE 29+	0.024	-1.159	-0.028	**-0.113**
PRIORSER	0.064	0.417	0.027	**0.041**
TRNSTO	0.078	1.974	0.154	**0.193**
USNA (reference)	0.194			
NROTC BC 1,2	0.090	-1.063	-0.096	**-0.104**
NROTC BC 3	0.103	-1.370	-0.141	**-0.134**
NROTC BC 4	0.077	-1.600	-0.123	**-0.156**
NROTC BC 5,6,7	0.046	-1.343	-0.062	**-0.131**
NROTC BC UNK	0.022	-1.629	-0.036	**-0.159**
OCS BC 1,2	0.040	-0.573	-0.023	**-0.056**
OCS BC 3	0.134	-0.640	-0.086	**-0.062**
OCS BC 4	0.141	-0.317	-0.045	-0.031
OCS BC 5,6,7	0.080	-0.192	-0.015	-0.019
OCS BC UNK	0.073	-0.514	-0.038	**-0.050**
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
2.094		**0.89**		

a. Bold independent variables indicate at least a significance of .05.

Table 23. Probability of Retention to LCDR Board (LCBDSTAY = 1)

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.216	0.216	
FEMALE	0.020	-0.492	-0.010	**-0.122**
MINORITY	0.067	-0.005	0.000	-0.001
SINGLE LT/0 (reference)	0.508			
SINGLE LT/1+	0.005	0.595	0.003	0.148
MARRIED LT/0	0.339	0.082	0.028	0.020
MARRIED LT/1	0.090	0.343	0.031	**0.085**
MARRIED LT/2	0.042	0.245	0.010	0.061
MARRIED LT/3+	0.016	0.702	0.011	**0.174**
NONTECH DEGREE	0.585	-0.055	-0.032	-0.014
AGE 20-22 (reference)	0.494			
AGE 23-24	0.291	0.054	0.016	0.013
AGE 25-26	0.133	0.083	0.011	0.021
AGE 27-28	0.058	0.579	0.034	**0.144**
AGE 29+	0.024	0.884	0.021	**0.219**
PRIORSER	0.064	0.451	0.029	**0.112**
ALWAYS NFO (reference)	0.735			
TRANSFER NFO	0.076	0.095	0.007	0.024
SNFO ATTRITE	0.132	-0.682	-0.090	**-0.169**
TSNFO ATTRITE	0.002	-0.766	-0.002	-0.190
NFO TRANSFERS	0.078	1.328	0.104	**0.329**
USNA (reference)	0.194			
NROTC BC 1,2,3	0.192	-0.098	-0.019	-0.024
NROTC BC 4,5,6,7	0.123	0.040	0.005	0.010
NROTC BC UNK	0.022	-0.157	-0.003	-0.039
OCS BC 1,2,3	0.174	-0.434	-0.076	**-0.108**
OCS BC 4,5,6,7	0.221	-0.333	-0.074	**-0.083**
OCS BC UNK	0.073	-0.355	-0.026	**-0.088**
CVN JET (reference)	0.449			
HAWKEYE	0.097	-0.211	-0.020	-0.052
MARITIME	0.314	-0.315	-0.099	**-0.078**
UNK PLATFORM	0.006	0.549	0.003	0.136
MTWING (<15) (reference)	0.245			
MTWING (16-21)	0.448	-0.015	-0.007	-0.004
MTWING (22-36)	0.154	0.354	0.055	**0.088**
MTWING (37-60)	0.015	2.128	0.032	**0.528**
MTWING (>60)	0.005	4.382	0.022	1.087
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.180		**0.5448**		

a. Bold independent variables indicate at least a significance of .05.

Table 24. Probability of Promotion to LCDR (LCDRPROM = 1)

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.857	0.844	
FEMALE	0.020	0.046	0.001	0.010
MINORITY	0.067	0.075	0.005	0.016
SINGLE LCDR/0 (reference)	0.177			
SINGLE LCDR/1+	0.013	-0.073	-0.001	-0.016
MARRIED LCDR/0	0.260	0.544	0.141	0.119
MARRIED LCDR/1	0.205	0.601	0.123	0.131
MARRIED LCDR/2	0.252	0.569	0.143	0.124
MARRIED LCDR/3+	0.092	0.551	0.051	0.121
NONTECH DEGREE	0.585	0.025	0.015	0.005
AGE 20-22 **(reference)**	0.494			
AGE 23-24	0.291	-0.262	-0.076	-0.057
AGE 25-26	0.133	-0.359	-0.048	-0.079
AGE 27-28	0.058	-0.302	-0.018	-0.066
AGE 29+	0.024	-0.377	-0.009	-0.082
PRIORSER	0.064	0.342	0.022	0.075
ALWAYS NFO (reference)	0.735			
TRANSFER NFO	0.076	0.176	0.013	0.038
SNFO ATTRITE	0.132	-0.594	-0.078	-0.130
TSNFO ATTRITE	0.002	-1.567	-0.003	-0.343
NFO TRANSFER	0.078	0.434	0.034	0.095
USNA(reference)	0.194			
NROTC BC 1,2,3	0.192	-0.359	-0.069	-0.079
NROTC BC 4,5,6,7	0.123	-0.311	-0.038	-0.068
NROTC BC UNK	0.022	-0.128	-0.003	-0.028
OCS BC 1,2,3	0.174	0.121	0.021	0.026
OCS BC 4,5,6,7	0.221	-0.179	-0.040	-0.039
OCS BC UNK	0.073	-0.309	-0.023	-0.068
CVN JET (reference)	0.449			
HAWKEYE	0.097	0.415	0.040	0.091
MARITIME	0.314	-0.073	-0.023	-0.016
UNK PLATFORM	0.006	-0.242	-0.001	-0.053
MTWING (<15) (reference)	0.245			
MTWING (16-21)	0.448	-0.356	-0.159	-0.078
MTWING (22-36)	0.154	-0.738	-0.114	-0.161
MTWING (37-60)	0.015	-0.868	-0.013	-0.190
MTWING (>60)	0.005	0.726	0.004	0.159
GRADUATE DEGREE	0.136	-0.115	-0.016	-0.025
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.739		**0.677**		

a. Bold independent variables indicate at least a significance of .05.

APPENDIX C. NOTIONAL CASES

1. TRAINING MODEL (NFOWING)

Notional SNFO #1 (Table 25): A 20-22 year old, Caucasian, male, technically degreed, USNA graduate that originally selected NFO without prior service would have a 95.4 percent chance of completing of flight school.

Notional SNFO #2 (Table 26): A 20-22 year old, Caucasian, male, technically degreed, NROTC BC 1 or 2 who originally selected NFO without prior service would have an 87.9 percent chance of completing of flight school.

Notional SNFO #3 (Table 27): A 20-22 year old, African-American, male, technically degreed, NROTC BC 1 or 2 who originally selected NFO without prior service would have a 74.5 percent chance of completing of flight school.

A Notional SNFO #4 (Table 28): 25-26 year old, Caucasian, male, technically degreed, OCS BC3 who originally selected NFO and with prior service would have a 90.2 percent chance of completing of flight school.

Table 25. Marginal Effects for Notional SNFO #1

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	3.041	3.041	
FEMALE	0.000	0.276	0.000	0.012
CAUCASIAN	1.000	0.000	0.000	0.000
AFRCNAMRCN	0.000	-0.904	0.000	-0.039
HISPANIC	0.000	-0.570	0.000	-0.025
OTHER	0.000	0.134	0.000	0.006
NONTECH	0.000	-0.277	0.000	-0.012
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.327	0.000	-0.014
AGE 25-26	0.000	-0.590	0.000	-0.026
AGE 27-28	0.000	-1.180	0.000	-0.051
AGE 29+	0.000	-1.159	0.000	-0.050
PRIORSER	0.000	0.417	0.000	0.018
TRNSTO	0.000	1.974	0.000	0.086
USNA	1.000	0.000	0.000	0.000
NROTC BC 1,2	0.000	-1.063	0.000	-0.046
NROTC BC 3	0.000	-1.370	0.000	-0.060
NROTC BC 4	0.000	-1.600	0.000	-0.070
NROTC BC 5,6,7	0.000	-1.343	0.000	-0.058
NROTC BC UNK	0.000	-1.629	0.000	-0.071
OCS BC 1,2	0.000	-0.573	0.000	-0.025
OCS BC 3	0.000	-0.640	0.000	-0.028
OCS BC 4	0.000	-0.317	0.000	-0.014
OCS BC 5,6,7	0.000	-0.192	0.000	-0.008
OCS BC UNK	0.000	-0.514	0.000	-0.022
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
3.041		**0.954**		

Table 26. Marginal Effects for Notional SNFO #2

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	3.041	3.041	
FEMALE	0.000	0.276	0.000	0.029
CAUCASIAN	1.000	0.000	0.000	0.000
AFRCNAMRCN	0.000	-0.904	0.000	-0.097
HISPANIC	0.000	-0.570	0.000	-0.061
OTHER	0.000	0.134	0.000	0.014
NONTECH	0.000	-0.277	0.000	-0.030
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.327	0.000	-0.035
AGE 25-26	0.000	-0.590	0.000	-0.063
AGE 27-28	0.000	-1.180	0.000	-0.126
AGE 29+	0.000	-1.159	0.000	-0.124
PRIORSER	0.000	0.417	0.000	0.045
TRNSTO	0.000	1.974	0.000	0.211
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2	1.000	-1.063	-1.063	-0.113
NROTC BC 3	0.000	-1.370	0.000	-0.146
NROTC BC 4	0.000	-1.600	0.000	-0.171
NROTC BC 5,6,7	0.000	-1.343	0.000	-0.143
NROTC BC UNK	0.000	-1.629	0.000	-0.174
OCS BC 1,2	0.000	-0.573	0.000	-0.061
OCS BC 3	0.000	-0.640	0.000	-0.068
OCS BC 4	0.000	-0.317	0.000	-0.034
OCS BC 5,6,7	0.000	-0.192	0.000	-0.020
OCS BC UNK	0.000	-0.514	0.000	-0.055
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
1.978		**0.8785**		

Table 27. Marginal Effects for Notional SNFO #3

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	3.041	3.041	
FEMALE	0.000	0.276	0.000	0.052
CAUCASIAN	0.000	0.000	0.000	0.000
AFRCNAMRCN	1.000	-0.904	-0.904	-0.172
HISPANIC	0.000	-0.570	0.000	-0.108
OTHER	0.000	0.134	0.000	0.025
NONTECH	0.000	-0.277	0.000	-0.053
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.327	0.000	-0.062
AGE 25-26	0.000	-0.590	0.000	-0.112
AGE 27-28	0.000	-1.180	0.000	-0.224
AGE 29+	0.000	-1.159	0.000	-0.220
PRIORSER	0.000	0.417	0.000	0.079
TRNSTO	0.000	1.974	0.000	0.375
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2	1.000	-1.063	-1.063	-0.202
NROTC BC 3	0.000	-1.370	0.000	-0.260
NROTC BC 4	0.000	-1.600	0.000	-0.304
NROTC BC 5,6,7	0.000	-1.343	0.000	-0.255
NROTC BC UNK	0.000	-1.629	0.000	-0.309
OCS BC 1,2	0.000	-0.573	0.000	-0.109
OCS BC 3	0.000	-0.640	0.000	-0.121
OCS BC 4	0.000	-0.317	0.000	-0.060
OCS BC 5,6,7	0.000	-0.192	0.000	-0.036
OCS BC UNK	0.000	-0.514	0.000	-0.098
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
1.074		**0.7454**		

Table 28. Marginal Effects for Notional SNFO #4

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	3.041	3.041	
FEMALE	0.000	0.276	0.000	0.024
CAUCASIAN	1.000	0.000	0.000	0.000
AFRCNAMRCN	0.000	-0.904	0.000	-0.079
HISPANIC	0.000	-0.570	0.000	-0.050
OTHER	0.000	0.134	0.000	0.012
NONTECH	0.000	-0.277	0.000	-0.024
AGE 20-22	0.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.327	0.000	-0.029
AGE 25-26	1.000	-0.590	-0.590	-0.052
AGE 27-28	0.000	-1.180	0.000	-0.104
AGE 29+	0.000	-1.159	0.000	-0.102
PRIORSER	1.000	0.417	0.417	0.037
TRNSTO	0.000	1.974	0.000	0.173
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2	0.000	-1.063	0.000	-0.093
NROTC BC 3	0.000	-1.370	0.000	-0.120
NROTC BC 4	0.000	-1.600	0.000	-0.140
NROTC BC 5,6,7	0.000	-1.343	0.000	-0.118
NROTC BC UNK	0.000	-1.629	0.000	-0.143
OCS BC 1,2	0.000	-0.573	0.000	-0.050
OCS BC 3	1.000	-0.640	-0.640	-0.056
OCS BC 4	0.000	-0.317	0.000	-0.028
OCS BC 5,6,7	0.000	-0.192	0.000	-0.017
OCS BC UNK	0.000	-0.514	0.000	-0.045
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
2.228		**0.9027**		

2. RETENTION MODEL (LCDRSTAY)

Notional NFO #1 (Table 29): A carrier jet NFO that earned his wings within 15 months who is a 20-22 year old, Caucasian, single male, technically degreed USNA graduate that originally selected NFO without prior service would have a 55.4 percent chance of remaining until the LCDR promotion board.

Notional NFO #2 (Table 30): A maritime NFO that earned her wings within 15 months who is a 20-22 year old, Caucasian, single female, technically degreed NROTC BC 1, 2, or 3 that originally selected NFO without prior service would have an 33.4 percent chance of remaining until the LCDR promotion board.

Notional NFO #3 (Table 31): A Hawkeye NFO that earned his wings within 18 months who is a 20-22 year old, African-American, single male, technically degreed NROTC BC 1, 2, or 3 that originally selected NFO without prior service would have a 47.4 percent chance of remaining until the LCDR promotion board.

Notional NFO #4 (Table 32): A maritime NFO that earned his wings within 15 months who is a 25-26 year old, Caucasian, single male, technically degreed OCS BC 1, 2, or 3 that originally selected NFO and had prior service would have a 50.0 percent chance of remaining until the LCDR promotion board.

Table 29. Marginal Effects for Retention of Notional NFO #1

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.216	0.216	
FEMALE	0.000	-0.492	0.000	-0.122
MINORITY	0.000	-0.005	0.000	-0.001
SINGLE LT/0	1.000	0.000	0.000	0.000
SINGLE LT/1+	0.000	0.595	0.000	0.147
MARRIED LT/0	0.000	0.082	0.000	0.020
MARRIED LT/1	0.000	0.343	0.000	0.085
MARRIED LT/2	0.000	0.245	0.000	0.061
MARRIED LT/3+	0.000	0.702	0.000	0.173
NONTECH	0.000	-0.055	0.000	-0.014
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	0.054	0.000	0.013
AGE 25-26	0.000	0.083	0.000	0.021
AGE 27-28	0.000	0.579	0.000	0.143
AGE 29+	0.000	0.884	0.000	0.218
PRIORSER	0.000	0.451	0.000	0.111
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.095	0.000	0.023
SNFO ATTRITE	0.000	-0.682	0.000	-0.169
TSNFO ATTRITE	0.000	-0.766	0.000	-0.189
NFO TRANSFERS	0.000	1.328	0.000	0.328
USNA	1.000	0.000	0.000	0.000
NROTC BC 1,2,3	0.000	-0.098	0.000	-0.024
NROTC BC 4,5,6,7	0.000	0.040	0.000	0.010
NROTC BC UNK	0.000	-0.157	0.000	-0.039
OCS BC 1,2,3	0.000	-0.434	0.000	-0.107
OCS BC 4,5,6,7	0.000	-0.333	0.000	-0.082
OCS BC UNK	0.000	-0.355	0.000	-0.088
CVN JET	1.000	0.000	0.000	0.000
HAWKEYE	0.000	-0.211	0.000	-0.052
MARITIME	0.000	-0.315	0.000	-0.078
UNK PLATFORM	0.000	0.549	0.000	0.136
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.015	0.000	-0.004
MTWING (22-36)	0.000	0.354	0.000	0.087
MTWING (37-60)	0.000	2.128	0.000	0.526
MTWING (>60)	0.000	4.382	0.000	1.083
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.216		**0.5538**		

Table 30. Marginal Effects for Retention of Notional NFO #2

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.216	0.216	
FEMALE	1.000	-0.492	-0.492	-0.109
MINORITY	0.000	-0.005	0.000	-0.001
SINGLE LT/0	1.000	0.000	0.000	0.000
SINGLE LT/1+	0.000	0.595	0.000	0.132
MARRIED LT/0	0.000	0.082	0.000	0.018
MARRIED LT/1	0.000	0.343	0.000	0.076
MARRIED LT/2	0.000	0.245	0.000	0.055
MARRIED LT/3+	0.000	0.702	0.000	0.156
NONTECH	0.000	-0.055	0.000	-0.012
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	0.054	0.000	0.012
AGE 25-26	0.000	0.083	0.000	0.018
AGE 27-28	0.000	0.579	0.000	0.129
AGE 29+	0.000	0.884	0.000	0.197
PRIORSER	0.000	0.451	0.000	0.100
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.095	0.000	0.021
SNFO ATTRITE	0.000	-0.682	0.000	-0.152
TSNFO ATTRITE	0.000	-0.766	0.000	-0.170
NFO TRANSFERS	0.000	1.328	0.000	0.296
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	1.000	-0.098	-0.098	-0.022
NROTC BC 4,5,6,7	0.000	0.040	0.000	0.009
NROTC BC UNK	0.000	-0.157	0.000	-0.035
OCS BC 1,2,3	0.000	-0.434	0.000	-0.097
OCS BC 4,5,6,7	0.000	-0.333	0.000	-0.074
OCS BC UNK	0.000	-0.355	0.000	-0.079
CVN JET	0.000	0.000	0.000	0.000
HAWKEYE	0.000	-0.211	0.000	-0.047
MARITIME	1.000	-0.315	-0.315	-0.070
UNK PLATFORM	0.000	0.549	0.000	0.122
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.015	0.000	-0.003
MTWING (22-36)	0.000	0.354	0.000	0.079
MTWING (37-60)	0.000	2.128	0.000	0.474
MTWING (>60)	0.000	4.382	0.000	0.975
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
-0.689		**0.3343**		

Table 31. Marginal Effects for Retention of Notional NFO #3

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.216	0.216	
FEMALE	0.000	-0.492	0.000	-0.123
MINORITY	1.000	-0.005	-0.005	-0.001
SINGLE LT/0	1.000	0.000	0.000	0.000
SINGLE LT/1+	0.000	0.595	0.000	0.148
MARRIED LT/0	0.000	0.082	0.000	0.020
MARRIED LT/1	0.000	0.343	0.000	0.085
MARRIED LT/2	0.000	0.245	0.000	0.061
MARRIED LT/3+	0.000	0.702	0.000	0.175
NONTECH	0.000	-0.055	0.000	-0.014
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	0.054	0.000	0.013
AGE 25-26	0.000	0.083	0.000	0.021
AGE 27-28	0.000	0.579	0.000	0.144
AGE 29+	0.000	0.884	0.000	0.220
PRIORSER	0.000	0.451	0.000	0.112
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.095	0.000	0.024
SNFO ATTRITE	0.000	-0.682	0.000	-0.170
TSNFO ATTRITE	0.000	-0.766	0.000	-0.191
NFO TRANSFERS	0.000	1.328	0.000	0.331
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	1.000	-0.098	-0.098	-0.024
NROTC BC 4,5,6,7	0.000	0.040	0.000	0.010
NROTC BC UNK	0.000	-0.157	0.000	-0.039
OCS BC 1,2,3	0.000	-0.434	0.000	-0.108
OCS BC 4,5,6,7	0.000	-0.333	0.000	-0.083
OCS BC UNK	0.000	-0.355	0.000	-0.088
CVN JET	0.000	0.000	0.000	0.000
HAWKEYE	1.000	-0.211	-0.211	-0.053
MARITIME	0.000	-0.315	0.000	-0.078
UNK PLATFORM	0.000	0.549	0.000	0.137
MTWING (<15)	0.000	0.000	0.000	0.000
MTWING (16-21)	1.000	-0.015	-0.015	-0.004
MTWING (22-36)	0.000	0.354	0.000	0.088
MTWING (37-60)	0.000	2.128	0.000	0.530
MTWING (>60)	0.000	4.382	0.000	1.092
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
-0.113		**0.4718**		

Table 32. Marginal Effects for Retention of Notional NFO #4

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.216	0.216	
FEMALE	0.000	-0.492	0.000	-0.123
MINORITY	0.000	-0.005	0.000	-0.001
SINGLE LT/0	1.000	0.000	0.000	0.000
SINGLE LT/1+	0.000	0.595	0.000	0.149
MARRIED LT/0	0.000	0.082	0.000	0.020
MARRIED LT/1	0.000	0.343	0.000	0.086
MARRIED LT/2	0.000	0.245	0.000	0.061
MARRIED LT/3+	0.000	0.702	0.000	0.175
NONTECH	0.000	-0.055	0.000	-0.014
AGE 20-22	0.000	0.000	0.000	0.000
AGE 23-24	0.000	0.054	0.000	0.013
AGE 25-26	1.000	0.083	0.083	0.021
AGE 27-28	0.000	0.579	0.000	0.145
AGE 29+	0.000	0.884	0.000	0.221
PRIORSER	1.000	0.451	0.451	0.113
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.095	0.000	0.024
SNFO ATTRITE	0.000	-0.682	0.000	-0.170
TSNFO ATTRITE	0.000	-0.766	0.000	-0.191
NFO TRANSFERS	0.000	1.328	0.000	0.332
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	0.000	-0.098	0.000	-0.024
NROTC BC 4,5,6,7	0.000	0.040	0.000	0.010
NROTC BC UNK	0.000	-0.157	0.000	-0.039
OCS BC 1,2,3	1.000	-0.434	-0.434	-0.108
OCS BC 4,5,6,7	0.000	-0.333	0.000	-0.083
OCS BC UNK	0.000	-0.355	0.000	-0.089
CVN JET	0.000	0.000	0.000	0.000
HAWKEYE	0.000	-0.211	0.000	-0.053
MARITIME	1.000	-0.315	-0.315	-0.079
UNK PLATFORM	0.000	0.549	0.000	0.137
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.015	0.000	-0.004
MTWING (22-36)	0.000	0.354	0.000	0.088
MTWING (37-60)	0.000	2.128	0.000	0.532
MTWING (>60)	0.000	4.382	0.000	1.095
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.001		**0.5002**		

3. PROMOTION MODEL (LCDRPROM)

Notional NFO #5 (Table 33): A carrier jet NFO that earned his wings within 15 months who is a 20-22 year old, Caucasian, single male, technically degreed USNA graduate that originally selected NFO without prior service would have a 69.9 percent chance of LCDR promotion.

Notional NFO #6 (Table 34): A carrier jet NFO that earned his wings within 15 months who is a 20-22 year old, Caucasian, single male, technically degreed NROTC BC 1, 2, or 3 that originally selected NFO without prior service would have a 61.8 percent chance of LCDR promotion.

Notional NFO #7 (Table 35): A Hawkeye NFO that earned his wings within 18 months who is a 20-22 year old, African-American, single male, technically degreed NROTC BC 1, 2, or 3 that originally selected NFO without prior service would have a 64.9 percent chance of LCDR promotion.

Notional NFO #8 (Table 36): A maritime NFO that earned his wings within 15 months who is a 25-26 year old, Caucasian, single male, technically degreed OCS BC 1, 2, or 3 that originally selected NFO and had prior service would have a 70.5 percent chance of LCDR promotion.

Notional NFO #9 (Table 37): A maritime NFO that earned his wings within 15 months who is a 25-26 year old, Caucasian, married male, technically degreed OCS BC 1, 2, or 3 that originally selected NFO and had prior service would have a 80.5 percent chance of LCDR promotion.

Table 33. Marginal Effects for Promotion to LCDR for Notional NFO #5

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.857	0.844	
FEMALE	0.000	0.046	0.000	0.010
MINORITY	0.000	0.075	0.000	0.016
SINGLE LCDR/0	1.000	0.000	0.000	0.000
SINGLE LCDR/1+	0.000	-0.073	0.000	-0.015
MARRIED LCDR/0	0.000	0.544	0.000	0.115
MARRIED LCDR/1	0.000	0.601	0.000	0.127
MARRIED LCDR/2	0.000	0.569	0.000	0.120
MARRIED LCDR/3+	0.000	0.551	0.000	0.116
NONTECH	0.000	0.025	0.000	0.005
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.262	0.000	-0.055
AGE 25-26	0.000	-0.359	0.000	-0.076
AGE 27-28	0.000	-0.302	0.000	-0.064
AGE 29+	0.000	-0.377	0.000	-0.079
PRIORSER	0.000	0.342	0.000	0.072
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.176	0.000	0.037
SNFO ATTRITE	0.000	-0.594	0.000	-0.125
TSNFO ATTRITE	0.000	-1.567	0.000	-0.330
NFO TRANSFERS	0.000	0.434	0.000	0.091
USNA	1.000	0.000	0.000	0.000
NROTC BC 1,2,3	0.000	-0.359	0.000	-0.076
NROTC BC 4,5,6,7	0.000	-0.311	0.000	-0.065
NROTC BC UNK	0.000	-0.128	0.000	-0.027
OCS BC 1,2,3	0.000	0.121	0.000	0.025
OCS BC 4,5,6,7	0.000	-0.179	0.000	-0.038
OCS BC UNK	0.000	-0.309	0.000	-0.065
CVN JET	1.000	0.000	0.000	0.000
HAWKEYE	0.000	0.415	0.000	0.087
MARITIME	0.000	-0.073	0.000	-0.015
UNK PLATFORM	0.000	-0.242	0.000	-0.051
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.356	0.000	-0.075
MTWING (22-36)	0.000	-0.738	0.000	-0.155
MTWING (37-60)	0.000	-0.868	0.000	-0.183
MTWING (>60)	0.000	0.726	0.000	0.153
GRADUATE DEGREE	0.136	-0.115	-0.016	-0.025
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.841		**0.699**		

Table 34. Marginal Effects for Promotion to LCDR for Notional NFO #6

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINA L
				LOGIT*P(1-P)
Constant	1.000	0.857	0.844	
FEMALE	0.000	0.046	0.000	0.011
MINORITY	0.000	0.075	0.000	0.018
SINGLE LCDR/0	1.000	0.000	0.000	0.000
SINGLE LCDR/1+	0.000	-0.073	0.000	-0.017
MARRIED LCDR/0	0.000	0.544	0.000	0.128
MARRIED LCDR/1	0.000	0.601	0.000	0.142
MARRIED LCDR/2	0.000	0.569	0.000	0.134
MARRIED LCDR/3+	0.000	0.551	0.000	0.130
NONTECH	0.000	0.025	0.000	0.006
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.262	0.000	-0.062
AGE 25-26	0.000	-0.359	0.000	-0.085
AGE 27-28	0.000	-0.302	0.000	-0.071
AGE 29+	0.000	-0.377	0.000	-0.089
PRIORSER	0.000	0.342	0.000	0.081
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.176	0.000	0.042
SNFO ATTRITE	0.000	-0.594	0.000	-0.140
TSNFO ATTRITE	0.000	-1.567	0.000	-0.370
NFO TRANSFERS	0.000	0.434	0.000	0.102
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	1.000	-0.359	-0.359	-0.085
NROTC BC 4,5,6,7	0.000	-0.311	0.000	-0.073
NROTC BC UNK	0.000	-0.128	0.000	-0.030
OCS BC 1,2,3	0.000	0.121	0.000	0.029
OCS BC 4,5,6,7	0.000	-0.179	0.000	-0.042
OCS BC UNK	0.000	-0.309	0.000	-0.073
CVN JET	1.000	0.000	0.000	0.000
HAWKEYE	0.000	0.415	0.000	0.098
MARITIME	0.000	-0.073	0.000	-0.017
UNK PLATFORM	0.000	-0.242	0.000	-0.057
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.356	0.000	-0.084
MTWING (22-36)	0.000	-0.738	0.000	-0.174
MTWING (37-60)	0.000	-0.868	0.000	-0.205
MTWING (>60)	0.000	0.726	0.000	0.171
GRADUATE DEGREE	0.136	-0.115	-0.016	-0.025
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.482		**0.6183**		

Table 35. Marginal Effects for Promotion to LCDR for Notional NFO #7

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.857	0.844	
FEMALE	0.000	0.046	0.000	0.010
MINORITY	1.000	0.075	0.075	0.017
SINGLE LCDR/0	1.000	0.000	0.000	0.000
SINGLE LCDR/1+	0.000	-0.073	0.000	-0.017
MARRIED LCDR/0	0.000	0.544	0.000	0.124
MARRIED LCDR/1	0.000	0.601	0.000	0.137
MARRIED LCDR/2	0.000	0.569	0.000	0.130
MARRIED LCDR/3+	0.000	0.551	0.000	0.125
NONTECH	0.000	0.025	0.000	0.006
AGE 20-22	1.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.262	0.000	-0.060
AGE 25-26	0.000	-0.359	0.000	-0.082
AGE 27-28	0.000	-0.302	0.000	-0.069
AGE 29+	0.000	-0.377	0.000	-0.086
PRIORSER	0.000	0.342	0.000	0.078
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.176	0.000	0.040
SNFO ATTRITE	0.000	-0.594	0.000	-0.135
TSNFO ATTRITE	0.000	-1.567	0.000	-0.357
NFO TRANSFERS	0.000	0.434	0.000	0.099
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	1.000	-0.359	-0.359	-0.082
NROTC BC 4,5,6,7	0.000	-0.311	0.000	-0.071
NROTC BC UNK	0.000	-0.128	0.000	-0.029
OCS BC 1,2,3	0.000	0.121	0.000	0.028
OCS BC 4,5,6,7	0.000	-0.179	0.000	-0.041
OCS BC UNK	0.000	-0.309	0.000	-0.070
CVN JET	0.000	0.000	0.000	0.000
HAWKEYE	1.000	0.415	0.415	0.094
MARITIME	0.000	-0.073	0.000	-0.017
UNK PLATFORM	0.000	-0.242	0.000	-0.055
MTWING (<15)	0.000	0.000	0.000	0.000
MTWING (16-21)	1.000	-0.356	-0.356	-0.081
MTWING (22-36)	0.000	-0.738	0.000	-0.168
MTWING (37-60)	0.000	-0.868	0.000	-0.198
MTWING (>60)	0.000	0.726	0.000	0.165
GRADUATE DEGREE	0.136	-0.115	-0.016	-0.025
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.616		**0.6494**		

Table 36. Marginal Effects for Promotion to LCDR for Notional NFO #8

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.857	0.844	
FEMALE	0.000	0.046	0.000	0.010
MINORITY	0.000	0.075	0.000	0.016
SINGLE LCDR/0	1.000	0.000	0.000	0.000
SINGLE LCDR/1+	0.000	-0.073	0.000	-0.015
MARRIED LCDR/0	0.000	0.544	0.000	0.113
MARRIED LCDR/1	0.000	0.601	0.000	0.125
MARRIED LCDR/2	0.000	0.569	0.000	0.118
MARRIED LCDR/3+	0.000	0.551	0.000	0.115
NONTECH	0.000	0.025	0.000	0.005
AGE 20-22	0.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.262	0.000	-0.055
AGE 25-26	1.000	-0.359	-0.359	-0.075
AGE 27-28	0.000	-0.302	0.000	-0.063
AGE 29+	0.000	-0.377	0.000	-0.078
PRIORSER	1.000	0.342	0.342	0.071
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.176	0.000	0.037
SNFO ATTRITE	0.000	-0.594	0.000	-0.124
TSNFO ATTRITE	0.000	-1.567	0.000	-0.326
NFO TRANSFERS	0.000	0.434	0.000	0.090
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	0.000	-0.359	0.000	-0.075
NROTC BC 4,5,6,7	0.000	-0.311	0.000	-0.065
NROTC BC UNK	0.022	-0.128	-0.003	-0.027
OCS BC 1,2,3	1.000	0.121	0.121	0.025
OCS BC 4,5,6,7	0.000	-0.179	0.000	-0.037
OCS BC UNK	0.000	-0.309	0.000	-0.064
CVN JET	0.000	0.000	0.000	0.000
HAWKEYE	0.000	0.415	0.000	0.086
MARITIME	1.000	-0.073	-0.073	-0.015
UNK PLATFORM	0.000	-0.242	0.000	-0.050
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.356	0.000	-0.074
MTWING (22-36)	0.000	-0.738	0.000	-0.154
MTWING (37-60)	0.000	-0.868	0.000	-0.181
MTWING (>60)	0.000	0.726	0.000	0.151
GRADUATE DEGREE	0.136	-0.115	-0.016	-0.025
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		
0.870		**0.7047**		

Table 37. Marginal Effects for Promotion to LCDR for Notional NFO #9

AVERAGE IMPACT:	COMBINED MARGINAL EFFECTS AT MEAN VALUES:			
VARIABLE	XBAR	LOGIT	X*LOGIT	MARGINAL
				LOGIT*P(1-P)
Constant	1.000	0.857	0.844	
FEMALE	0.000	0.046	0.000	0.007
MINORITY	0.000	0.075	0.000	0.012
SINGLE LCDR/0	0.000	0.000	0.000	0.000
SINGLE LCDR/1+	0.000	-0.073	0.000	-0.011
MARRIED LCDR/0	1.000	0.544	0.544	0.085
MARRIED LCDR/1	0.000	0.601	0.000	0.094
MARRIED LCDR/2	0.000	0.569	0.000	0.089
MARRIED LCDR/3+	0.000	0.551	0.000	0.087
NONTECH	0.000	0.025	0.000	0.004
AGE 20-22	0.000	0.000	0.000	0.000
AGE 23-24	0.000	-0.262	0.000	-0.041
AGE 25-26	1.000	-0.359	-0.359	-0.056
AGE 27-28	0.000	-0.302	0.000	-0.047
AGE 29+	0.000	-0.377	0.000	-0.059
PRIORSER	1.000	0.342	0.342	0.054
ALWAYS NFO	1.000	0.000	0.000	0.000
TRANSFER NFO	0.000	0.176	0.000	0.028
SNFO ATTRITE	0.000	-0.594	0.000	-0.093
TSNFO ATTRITE	0.000	-1.567	0.000	-0.246
NFO TRANSFERS	0.000	0.434	0.000	0.068
USNA	0.000	0.000	0.000	0.000
NROTC BC 1,2,3	0.000	-0.359	0.000	-0.056
NROTC BC 4,5,6,7	0.000	-0.311	0.000	-0.049
NROTC BC UNK	0.000	-0.128	0.000	-0.020
OCS BC 1,2,3	1.000	0.121	0.121	0.019
OCS BC 4,5,6,7	0.000	-0.179	0.000	-0.028
OCS BC UNK	0.000	-0.309	0.000	-0.049
CVN JET	0.000	0.000	0.000	0.000
HAWKEYE	0.000	0.415	0.000	0.065
MARITIME	1.000	-0.073	-0.073	-0.011
UNK PLATFORM	0.000	-0.242	0.000	-0.038
MTWING (<15)	1.000	0.000	0.000	0.000
MTWING (16-21)	0.000	-0.356	0.000	-0.056
MTWING (22-36)	0.000	-0.738	0.000	-0.116
MTWING (37-60)	0.000	-0.868	0.000	-0.136
MTWING (>60)	0.000	0.726	0.000	0.114
GRADUATE DEGREE	0.136	-0.115	-0.016	-0.025
Z=S(X*LOGIT)		**P=1/(1+e^-Z)**		

APPENDIX D. BARRON’S COLLEGE PROFILE

A INTERNAT	7	ANGELO SU	5	B JONES	7	BETHEL KAN	4
A PEAY	4	ANTILLIAN	4	BABSON MA	3	BETHEL MIN	5
ABILENE CH	4	ANTIOCH	4	BABSON MS	3	BETHEL TEN	5
ACADIA U	7	APPALACHIA	4	BAKER U	4	BETHNY	4
ADAMS	4	AQUINAS	4	BALDWIN W	4	BETHNY KAN	4
ADAMS CO	4	ARAB GULF	7	BALDWIN WA	4	BETHNY WVA	4
ADELPHI	3	ARIZ SU	4	BALL SU	5	BETHUME CO	5
ADELPHIA	3	ARIZONA	4	BAPT SC	4	BETHUNE CO	5
ADRIAN	4	ARIZONA SU	4	BARAT C	4	BIBLE CAN	7
AERO SPACE	7	ARKANS PLY	6	BARBER SCO	5	BIBLE PA	7
ALABAM A&M	5	ARKANS SU	6	BARD NY	3	BIOLA CAL	4
ALABAMA C	7	ARKANS TEC	6	BARRINGTON	7	BIRMINGHAM	4
ALABAMA SU	5	ARKANSAS C	4	BARRY FLA	4	BISHOP TEX	4
ALASKA PAC	4	ARMSTG GA	5	BATES ME	2	BISHOPS U	7
ALBANY C P	7	ARMSTRONG	5	BAYLOR	3	BLACK HILL	5
ALBANY GA	4	ASBURY C	4	BEAVER	4	BLACKBURN	4
ALBANY MED	7	ASHLAND OH	4	BELHAVEN	4	BLOOMFIELD	5
ALBION	3	ASSMPTN MA	4	BELKNAP NH	7	BLOOMSBURG	4
ALBRIGHT	3	ASSMPTN MS	4	BELLEVE	6	BLUFFTON O	4
ALBUQUERQU	5	ASSMTN MS	4	BELLEVUE	6	BLUFLD VA	5
ALCORN	5	ATHENS	7	BELLIN WIS	7	BLUFLD WVA	5
ALCORN MS	5	ATLANTC CH	5	BELLRMN KY	4	BOISE ID	6
ALDERSON B	4	ATLANTC UN	5	BELMONT	5	BORROMEO O	7
ALFRED	3	AUB URN U	2	BELMONT AB	5	BOSTON C	2
ALFRED NY	3	AUBURN	2	BELOIT	3	BOSTON COL	2
ALFRED U	3	AUBURN U	2	BEMIDJI	4	BOSTON SC	2
ALLEGHENY	3	AUBURN N Y	5	BENDICTN	4	BOSTON U	2
ALLEGHNEY	3	AUBURN U	2	BENDICTN C	4	BOWDIN ME	1
ALLENTOWN	5	AUBURN Y	5	BENEDICT	4	BOWDOIN	1
ALLIANCE	4	AUBURNU	2	BENEDICTIN	4	BOWDOIN ME	1
ALMA MICH	3	AUGSBURG	4	BENNETT NC	5	BOWIE MD	5
ALVERNIA	4	AUGSTNA C	5	BENNINGTON	4	BOWL GR KY	4
ALVERNO	4	AUGSTNA SD	3	BENTLEY MA	3	BOWL GRN O	4
AMER TEC U	7	AUGUSTA GA	5	BENTLEY MS	3	BRADLEY IL	4
AMERICAN U	3	AUGUSTNA	5	BERA KY	4	BRANDEIS	2
AMHEARST	1	AUGUSTNA C	5	BEREA KY	4	BRENAU GA	5
AMHERST	1	AURBURN U	2	BERKLEE MU	7	BRESCIA KY	4
ANDERBILT	2	AURORA ILL	4	BERRY GA	4	BRIAR CLFF	4
ANDREWS	4	AUSTIN C	3	BETH-EL CO	5	BRIDGEWATE	4
ANDRSN	4	AVERETT VA	4	BETHANY NA	4	BRIDGWR MA	4
ANDRSN IND	4	AVILA KC	4	BETHEL COL	5	BRIDGWR MS	4
ANGELO SC	5	AZUSA CAL	4	BETHEL IND	5	BRIDGWR VA	4

BRKLYN LAW	7
BROOK INST	7
BROOME NY	6
BROWN U	1
BRYAN	4
BRYANT RI	4
BRYN MAWR	1
BSTON U	2
BUCKNELL	2
BUENA VIST	4
BUTLER IND	4
BYU UTAH	3
C ATLANTIC	3
C BIBLE MO	7
C C SEATLE	4
C CONNECTI	4
C IDAHO	4
C MICHIGAN	4
C MISSOURI	5
C NEWPORT	5
C WASHINGT	4
C WESLEYAN	4
CA POL POM	4
CA POL SLO	3
CA SU LB	4
CAL	4
CAL BAPT	5
CAL IN ART	7
CAL LUTH	4
CAL MRTM	4
CAL POLY	3
CAL SC BKF	4
CAL SC D H	3
CAL SC FUL	4
CAL SC HAY	5
CAL SC LA	4
CAL SC LB	4
CAL SC SB	3
CAL SC SON	4
CAL SC STA	4
CAL SU BKF	4
CAL SU D H	2
CAL SU FUL	4
CAL SU HAY	5
CAL SU LA	4
CAL SU LB	4
CAL SU PAC	4
CAL SU SAC	4
CAL SU SB	4
CAL SU SD	2
CAL SU SF	2
CAL SU SJ	2
CAL SU SM	4
CAL SU STA	4
CAL TECH	4
CAL WESTRN	7
CALIFOR PA	4
CALPO SLO	3
CALPOL POM	3
CALPOL SLO	3
CALPOL SU	3
CALSU CHIC	4
CALSU FRES	4
CALSU LB	4
CALSU NRDG	4
CALSU SAC	4
CALVIN C	4
CAMERON	5
CAMERON U	5
CAMPBELLSV	4
CAMPBL	4
CAMPBL NC	4
CANISIUS	3
CAPITAL OH	4
CAPITOL MD	6
CAPITOL OH	4
CARLETON	2
CARLOW C	5
CARNEGI	2
CARNEGIE	2
CARROL WS	5
CARROLL	4
CARROLL MT	4
CARROLL WI	4
CARROLL WS	4
CARSON NEW	5
CARTHAGE	4
CASE TECH	3
CASE WR U	3
CASTLETON	4
CATAWBA	4
CATHLC DC	3
CATHLC PR	4
CAYETANO	7
CC CHGO	7
CEDAR CRES	5
CEDRVIL OH	4
CENTNRY LA	4
CENTNRY NJ	5
CENTRAL IA	3
CENTRAL MO	3
CENTRE KY	2
CHADRON	5
CHALESTON	4
CHAMINADE	4
CHAMPMAN	4
CHAPMAN	4
CHAPMAN CA	4
CHARLESTON	4
CHARLTN SO	4
CHESTNUT H	4
CHEYNEY PA	5
CHGO SU	5
CHICO CAL	4
CHRIST CAL	7
CHRISTN BR	3
CHRISTN CA	4
CITADEL	4
CITY U MAN	4
CITY U NY	3
CITY U WA	4
CLAFLIN SC	5
CLARION PA	4
CLARK ATL	4
CLARK GA	4
CLARK MASS	4
CLARKSN NE	3
CLARKSON	3
CLARMNT MC	2
CLASKSON	3
CLASU FRES	4
CLEMSOM U	3
CLEMSON	3
CLEMSON U	3
CLEVD SU	6
CLEVLD SU	6
CNTRL METH	6
CNTRL OHIO	6
CNTRL OKLA	6
COE IOWA	4
COKER C SC	4
COLBIA MO	5
COLBY ME	2
COLBY NH	2
COLEMAN	7
COLGATE	2
COLGATE U	2
COLMBIA BC	5
COLMBIA IL	4
COLMBIA MD	4
COLMBIA MO	1
COLMBIA NY	1
COLO MINES	2
COLO SU	4
COLO WOMN	3
COLORAD SC	3
COLORADO C	3
COLUMBIA	1
COLUMBIA N	2
COLUMBUS	5
COLUNBIA C	4
CONCDIA GR	4
CONCDIA IL	4
CONCDIA IN	4
CONCDIA MH	4
CONCDIA MN	4
CONCDIA NB	4
CONCDIA NE	4
CONCDIA SP	4
CONCDIA TC	4
CONCDIA U	4
CONCDIA WI	4
CONCORD WV	5
CONNECTI C	3
COOPER UN	1
COPPIN MD	5
CORNELL	1
CORNELL IA	1
CORNELL IL	4
CORNELL NY	1
CORPUS CHR	7
COVENANT C	4
CREIGHTON	3
CSU HUMBLT	4

CULVER ST	4	DRAKE	4	EMPORIA SU	6	FRNKLN OH	2
CUMBRLD KY	5	DREW NJ	3	ERSKINE SC	4	FRNKLN&MAR	2
CUMBRLD TN	5	DREXEL U	3	EUREKA ILL	4	FROSTBURG	4
CURRY MASS	5	DRURY	4	EVANGEL MO	4	FT LAUDER	6
D LIPSCOMB	4	DRURY MO	4	EVERGREEN	3	FT WAYNE B	4
D WEBSTER	4	DUKE	1	F DICKINSO	4	FURMAN	2
DAEMEN C	4	DUQUENSE	4	F ILLINOIS	4	FURMAN SC	2
DAKOTA WES	5	DUQUESEN	4	F MARION	5	FURMAN U	2
DALHOUSIE	4	DUQUESNE	4	FAIRFIELD	3	G ADOLPHUS	3
DALLAS BAP	4	DYOUVILLE	4	FAIRMONT	5	G PEABODY	7
DALLAS TH	4	E CAROLI	5	FAR E PHIL	7	G RAPIDS B	4
DANA NEBR	4	E CAROLINA	5	FAYETTEVIL	5	G WILLIAMS	5
DARTHMOUTH	1	E CNTRL OK	5	FEATI PHIL	7	GA TECH	2
DARTMOUTH	1	E CONN SC	4	FERRI MI	5	GA COL MIL	5
DAVIDSON	2	E CONN SU	4	FERRIS	5	GA SOUTHRN	4
DAVIS&ELKI	4	E ILLINOIS	4	FERRIS MI	5	GA TECH	2
DE L SAL P	4	E KENTUCKY	5	FINDLAY OH	4	GA TGECH	2
DEFIANCE	4	E MENNONIT	4	FISK TENN	4	GANNON PA	4
DELAWARE S	5	E MICHIGAN	4	FITCHBURG	4	GARDNER WE	5
DELAWARE V	5	E MONTANA	6	FLA STHRN	4	GASOUTHRN	4
DELTA MISS	5	E NAZARENE	4	FLA A&M	5	GEN MOTORS	7
DENISON	4	E NEW MEX	6	FLA I TECH	3	GENEVA PA	4
DEPAUL ILL	3	E NEW MEXI	6	FLA INTL U	3	GEO MASON	4
DEPAUW ILL	3	E STROUDSB	4	FLA KEYS	7	GEORGETN	1
DEPAUW IND	3	E TENN SU	4	FLA LANT U	3	GEORGETN U	1
DETRT BUS	6	E TENN U	4	FLA PRESBY	7	GEORGI SU	4
DETRT TECH	6	E TENNESSE	4	FLA STHRN	4	GEORGIA	4
DEVRY ARIZ	5	E TEXAS SU	5	FLA SU	4	GEORGIA SU	4
DEVRY CA	5	E WASHINGT	4	FLA TECH U	3	GEORGIA SW	4
DEVRY GA	5	EARLHAM	4	FLAGLER C	4	GEORGN CT	4
DEVRY ILL	5	EASTRN PA	4	FLATECH U	3	GEORGTN KY	1
DEVRY MO	5	ECKERD	4	FLORIDA	3	GEORGTN U	1
DEVRY OH	5	EDGEWOOD	5	FLORIDA SU	3	GERRGIA SW	5
DEVRY TX	5	EDINBORO	5	FONTBONNE	4	GETTSYBURG	3
DICKNSN C	2	EISNHWR NY	7	FORDHAM	3	GETTYSBURG	3
DILLARD	4	ELIZBTHTWN	4	FORT HAYS	6	GLASGOWCNS	4
DILLARD LA	4	ELMHURST	5	FORT LEWIS	4	GLASSBORO	4
DITOO	7	ELMIRA NY	4	FORT VALLE	4	GLENVILLE	5
DITTO	7	ELON NC	5	FRAMINGHAM	4	GMI ENG MI	7
DOANE NEB	4	ELX CTY SU	5	FRANCSN U	4	GOLDN GT U	3
DOMIN C NY	4	ELZ CTY SU	5	FREDRCK VA	7	GONZAGA	4
DOMNCN CAL	4	EMBRY RIDL	6	FREED HARD	4	GORDON GA	4
DON BOSCO	7	EMERSON	4	FRESNO S	4	GORDON MAS	4
DORDT IOWA	6	EMMANL MAS	4	FRIENDS KS	5	GOUCHER	4
DORSET ENG	7	EMORY U	2	FRNKLN IND	2	GOVERNORS	7
DOWLING	4	EMORY&HENR	4	FRNKLN NH	2	GRACE IND	4

GRACELAND	4	HENDRIX	3	ITHACA	4	KY WESLEYN	4
GRAMBLING	6	HENDRSN AK	6	J BROWN	4	L SUPERIOR	4
GRAND CANY	4	HENDRSN AR	6	J C SMITH		LA CROSSE	5
GRAND VIEW	6	HENDRSN TX	6	J CARROLL	4	LA GRANGE	5
GRAND VLY	4	HIGH POINT	5	J HOPKINS	1	LA ROCH	5
GREAT FALL	6	HILLSDALE	5	J MARSHALL	7	LA ROCHE	4
GREENSBORO	4	HIRAM OHIO	4	JACKSN A	5	LA VERNE	4
GREENVILLE	4	HOBART W S	3	JACKSN MIS	5	LADY ELMS	5
GRINNELL	2	HOBART WS	3	JACKSN SU	4	LADY LAKE	5
GROVE CITY	3	HOFSFRA	3	JACKSNL F	4	LAFAYETTE	2
GUAM	6	HOFSTRA	3	JACKSNVL A	5	LAKE ERIE	4
GUILFORD	4	HOLLINS	4	JACKSNVL F	5	LAKE FORES	3
GWO	3	HOOD MD	4	JACKSNVLF	5	LAKELAND	4
GWU	3	HOPE MICH	4	JACKSVNL F	4	LAMAR TEX	6
GWYNEDD PA	4	HOUGHTON	3	JAMESTN ND	4	LAMBUTH	4
H APOSTLES	7	HOWARD DC	4	JEFFERSON	3	LANDER SC	4
H CROSS	2	HSTN BAPT	4	JERSEY CTY	4	LANE TENN	5
H CROSS DC	2	HUMBLT SU	4	JOHNS&WLS	5	LASALL PA	4
H CROSS MA	2	HUMBOLDT	4	JOHNSON VT	5	LASALLE PA	4
H CROSS MS	2	HUNTINGDON	3	JONES JAX	4	LAWRNC MCH	3
H FAMILY	4	HURON SD	5	JUNIATA PA	4	LAWRNC MI	4
H MUDD CAL	1	HUSSON ME	5	KALAMAZOO	2	LAWRNC WIS	3
H NAMES CA	4	HUSTON TIL	6	KANS NEW	6	LEBANON V	4
H PAYNE	5	IDAHA SU	6	KANS PITTS	5	LEE TENN	5
H SPIRIT	7	IDAHO SU	6	KANS SC	5	LEEHIGH PA	2
HAHNEMN PA	7	ILL BENEDT	4	KANS WESLY	4	LEHIGH PA	2
HAMELINE	4	ILL SU	4	KANSAS SU	6	LEMOYNE-OW	5
HAMILTON	2	ILL TECH	2	KANSAS STC	6	LEMOYNE	5
HAMLINE	4	ILL WESLYN	3	KANSAS SU	6	LEMOYNE NY	3
HAMPDEN SY	4	ILLINOIS C	4	KEAN C NJ	4	LEMOYNE OW	5
HAMPSHIRE	3	IMMAC PA	4	KEARNEY	6	LENOIR RHY	4
HAMPTON FL	4	INCARNT WD	4	KEENE NH	4	LETOURN TX	4
HAMPTON U	4	IND CNTRL	4	KEENE NY	4	LEWIS CLAR	4
HAMPTON VA	4	IND TECH	4	KENNESAW	5	LEWIS ILL	4
HANOVER	3	IND U PA	3	KENT	6	LEWIS&CLAR	6
HARDIN SIM	5	INDIANA U	3	KENT OHIO	6	LIBERTY VA	5
HARDING	4	INDIANA SC	5	KENT STATE	6	LIMSTNE SC	5
HARTWICK	6	INDIANA SU	3	KENTUCKY S	5	LINCOLN MO	5
HARVARD	1	INDIANA U	3	KENYON	2	LINCOLN PA	5
HASTINGS	4	INDU PA	3	KEUKA NY	4	LINCOLN TN	4
HAVERFORD	1	INTR AM PR	4	KING TENN	4	LINDENWOOD	4
HAWAII LOA	4	INTRCOL	4	KINGS NY	4	LINFIELD	4
HAWAII PAC	4	INTRCOL CN	4	KINGS PA	4	LIPA CITY	7
HAWTHORNE	5	IONA NY	4	KNOX ILL	3	LITTLE ROC	5
HAYWARD	5	IOWA SU	4	KNOXVILLE	4	LIVINGST U	5
HEIDELBERG	4	IOWA WESLY	4	KUTZTOWN	5	LOCK HAVEN	4

LOCKHAVEN	4	MARIETTA	4	METRO CO	6	MONT MS&T	6
LOMA LINDA	5	MARION IND	5	METRO MINN	7	MONT SU	6
LONG IS U	4	MARIST NY	4	METRO MN	7	MONTANA SU	6
LONGWOOD	4	MARQUETTE	3	METRO SC	7	MONTCLAIR	4
LORAS	5	MARS HILL	5	METRO SU	7	MONTEREY	7
LORAS IOWA	5	MARSHALL	4	MIAMI OH	2	MOODY BIBL	7
LORETTO HT	4	MARSHALL U	4	MIAMI OHIO	2	MOOREHEAD	4
LOUISIAN C	4	MARY NDAK	4	MIANE MRTM	5	MOORHEAD	4
LOWELL SC	3	MARY WASH	4	MICH SU	3	MORAVIAN	4
LOWELL TEC	3	MARYCREST	4	MICH TECH	3	MOREHEAD	5
LOY MRYM U	4	MARYKNL IL	7	MIDAM BAPT	6	MOREHOUSE	5
LOYOLA	4	MARYMNT	4	MIDAM NZRN	6	MORGAN	4
LOYOLA BAL	3	MARYMNT KS	5	MIDDLEBURY	3	MORNINGSDE	4
LOYOLA CHI	3	MARYMNT NY	4	MIDLAND	5	MORRIS SC	6
LOYOLA ORL	3	MARYMNT VA	4	MIDWESTERN	5	MST CLARE	5
LPI	3	MARYVL MO	4	MILLERSUIL	4	MST JOS O	4
LSU	6	MARYVL TEN	4	MILLERSVIL	4	MST JOS OH	4
LTU	6	MARYWOOD	4	MILLERSVL	4	MST MRY CA	4
LUBBOCK TX	6	MASS MRTM	4	MILLIGAN	4	MST MRY MD	4
LUTHER IA	4	MASS PHARM	4	MILLIKIN	4	MST MRY NY	4
LUZON C	7	MAYVILLE	4	MILLS CAL	3	MST VINCEN	4
LYCOMING	4	MCGILL CAN	7	MILLSAPS	3	MT ANGEL S	7
LYNCHBURG	4	MCKENDREE	4	MILWK END	3	MT HOLYOKE	2
LYNDON VT	5	MCMURRY	4	MILWK ENG	3	MT MERCY C	3
M BALDWIN	5	MCNEESE	6	MINN BIBLE	7	MT MRTY SD	4
M BROWN GA	5	MD INST	7	MINOT DK	6	MT MRY WIS	4
M HARVEY	1	MEDAILLE	5	MINOT ND	6	MT UNION	4
M TENNESEE	4	MEDICAL GA	7	MISERICORD	7	MT UNION O	4
M TENNESSE	4	MEDICAL OH	7	MISS COL	4	MT VERNON	5
MACALESTER	2	MEDICAL PA	7	MISS S U	3	MTLLSAPS	7
MACMURRAY	4	MEDICAL SC	7	MISS SU	3	MU OMAHA	6
MADISON	3	MEMPHIS	4	MISS U WOM	5	MUHLENBERG	3
MADISON VA	3	MEMPHIS SC	4	MISS VAL U	5	MURRAY SU	6
MADONNA	4	MEMPHIS SU	4	MISSOURI	4	MUSKINGUM	4
MAINE MRTM	5	MENLO CAL	4	MIT	1	N ARINONA	4
MAINE MTRM	5	MENNITE IL	7	MNTRY INST	7	N ARIZONA	4
MALLOY C	4	MERCER	4	MO BAPTIST	4	N C WESLYN	5
MANCHESTER	5	MERCY D IA	4	MO SO COL	6	N CNTRL IL	4
MANHATN	3	MERCY MICH	4	MO VALLEY	5	N CNTRL MN	7
MANHATN C	3	MERCY NY	5	MO WSTRN S	6	N COLORADO	4
MANHATNVIL	3	MERCYHURST	4	MO WSTRNS	6	N DAK SU	4
MANILA CEN	7	MERRIMACK	4	MOBILE ALA	4	N DAME IN	1
MANKATO	5	MESA COLO	4	MOLLOY C	4	N DAME IND	1
MANSFIELD	4	MESABI SJC	7	MONMTH ILL	4	N DAME MD	1
MAPUA INST	7	MESSIAH PA	3	MONMTH NJ	4	N DAME ND	1
MARIAN IND	5	METHODIST	5	MONMTHH NJ	4	N DAME OH	4

N ENGLAND	5	NIAGARA NY	4	OHIO DOMIN	4	PEABODY MD	7
N FLORIDA	4	NICHOL SU	6	OHIO NORTH	4	PEMBROKE	5
N GEORGIA	5	NICHOLLS	6	OHIO STATE	6	PEN SU	5
N HAWTHORN	7	NICHOLS	6	OHIO TECH	5	PENN S U	5
N ILLINOIS	4	NICHOLS SU	4	OHIO U	5	PENN SU	5
N KENTUCKY	6	NJ I TECH	3	OHIO WESLY	4	PENNS U	5
N MEX HLND	5	NJ MED&DEN	7	OKLA BAPT	4	PEPPERDINE	3
N MEX MINE	3	NORFOLK	4	OKLA CHRST	6	PEPPERDN	3
N MEX SU	4	NORFOLK SC	4	OKLA CTY U	4	PEPPERINE	3
N MEX U	4	NORFOLK SU	4	OKLA PANHD	6	PERU NEBR	6
N MICHIGAN	4	NORFOLK VA	4	OKLA SU	5	PERU NEBR	6
N MONTANA	6	NORTH ADAM	4	OKOA SU	5	PFEIFFER	4
N PARK	4	NORTHLAND	5	OLD DOM U	4	PHIL ART	7
N TEXAS	4	NORTHRN SD	5	OLD DOM UA	4	PHIL BIBLE	7
NALT U CAL	5	NORTHROP	5	OLD DOM VA	4	PHIL PHARM	7
NASSON ME	7	NORTHWOOD	4	OLD DOMIN	4	PHIL TEXL	4
NAT U CAL	5	NORWICH	4	OLD DOMU	4	PHIL TEXTL	4
NATL-LOUIS	4	NORWICH U	4	OLIVET MCH	4	PHILLIPS	4
NATL SD	5	NORWICK	4	OLIVET NAZ	4	PIEDMNT GA	5
NATL U CAL	5	NOVA U FLA	4	ORE HLTH U	7	PITTSBG KS	4
NAZRTH MI	4	NW LOUISA	6	ORE TECH	4	PITZER CAL	3
NAZRTH NY	4	NW LOUISIA	6	OREG ST U	4	PLATTEVILL	4
NC AG&TECH	5	NW MISSOUR	5	OREGON	4	PLYMOUTH	4
NC CENT U	5	NW MO SU	5	OREGON SU	4	POINT LOMA	4
NC STATE	3	NW NAZAREN	5	OREGON ED	4	POINT PK	4
NC STATE U	3	NW OKLAHOM	5	OREGON S U	4	POINY LOMA	4
NC WESLYN	5	NW SU LA	6	OREGON ST	4	POLY BRKLN	3
NE BIBLE	7	NWESTRN	1	OREGON SU	4	POLY NY	3
NE ILL U	5	NWESTRN IL	1	OTTAWA KS	4	POMONA	1
NE LOUISA	6	NWESTRN OK	5	OTTERBEIN	4	PORTLAND S	4
NE LOUISIA	6	NWESTRW IL	1	OUACHITA	5	PORTLND SU	4
NE MISSOUR	3	NWSTRN IA	1	OXFORD	7	PRAIRE TX	5
NE MO SU	3	NWSTRN MN	5	OZARKS ARK	6	PRAIRIE TX	5
NE OKLA	5	NY CTY TC	4	OZARKS MO	4	PRATT NY	4
NE OKLA SU	5	NY MRTM	3	P SMITH	5	PRESBTN SC	4
NEASTERN	5	NY MTRM	3	PAC CHRS	4	PRINCETN	1
NEASTRN MS	5	NY NRTM	3	PAC LUTHRN	3	PRINCETN U	1
NEBR WESLY	4	NY TECH	4	PAC U ORE	4	PRINCIPA	4
NEBRASKA	4	NYU	3	PAC UNION	5	PRINCIPIA	4
NEUMANN PA	4	O ROBRTS U	3	PAC WASH	3	PROVIDENCE	3
NEW C CA	6	OAKLAND U	4	PACE NY	4	PUNJAB U	7
NEW CHURCH	7	OAKLND IND	6	PAINE GA	4	PURDDUE	3
NEW HAMP	4	OAKWOOD	4	PAN AM TEX	6	PURDEU	3
NEW MEX SU	4	OBERLIN	2	PANAM TEX	6	PURDUE	3
NEWBERRY	5	OCCIDENTAL	3	PARK MD	4	QUINCY ILL	4
NEWMAN KAN	6	OGLETHORPE	3	PARK MO	5	QUINNIPAC	4

QUINNIPIAC	4	S DIEGO SU	4	SDIEGO SU	4	SO MAINE	4
R I DESIGN	7	S F AUSTIN	5	SE LOUISA	6	SO MISISS	4
R MORRIS	4	S FERNANDO	4	SE LOUISIA	6	SO MISSION	4
R SAGE	4	S FRAN ART	4	SE MASS U	4	SO MISSISS	4
R SAGE NY	4	S FRAN S	4	SE MISSOUR	5	SO OREGON	4
R WILLIAMS	4	S FRAN SU	4	SE MO SU	5	SO SEVENTH	5
RADFORD	4	S FRAN SUN	4	SE MS U	5	SOC RESRCH	7
RAMAPO	4	S FRASER U	7	SE MSS U	5	SOILLINOI	4
RAMAPO NJ	4	S HOUSTON	5	SE OKAL SU	5	SONOMA SU	4
RAMAPO NJ	4	S INTL TRG	4	SE OKLA S	5	SOUTHRN LA	6
RANDLPH C	4	S JACINTO	7	SE OKLA SU	5	SOUTHRN SD	4
RANDLPH WC	2	S JOAQUIN	4	SEATTLE P	4	SPALDING C	5
REED ORE	2	S JOS IND	4	SEATTLE U	4	SPALDING U	5
REGIS COLO	5	S JOSE SC	4	SETON HALL	4	SPAULDNG	5
REGIS MASS	5	S JOSE SU	4	SETON HILL	4	SPELMAN	4
RENSSELAER	2	S JOSESU	4	SHAW NC	4	SPR GARDEN	4
RENSSELAWR	2	S LAWRENCE	3	SHENANDH C	4	SPRING ARB	4
RENSSELEAR	2	S LUID REY	7	SHEPHERD	4	SPRING HIL	4
RHODE IS C	4	S MERRITT	7	SHIPPENSB	4	SPRNGED M	4
RHODES TN	3	S NAZARENE	7	SHIPPENSBG	4	SPRNGFD M	4
RICE	1	S ROSS TEX	5	SHORTER GA	4	SPRNGFD IL	4
RIDER NJ	4	S TEX LAW	7	SIENA HTS	4	SPRNGFD M	4
RIPON	4	S UTAH SC	6	SIENA NY	3	SPRNGFD MA	4
ROANOKE	4	SACRMTO SC	4	SIERRA NEV	5	SPRNGFD MS	4
ROBTS WSLY	4	SAGINAW MI	4	SILVER LAK	5	ST AMBROSE	4
ROCHSTR NY	4	SAGINAW VC	4	SIMMONS MA	4	ST ANDREWS	4
ROCKFORD	4	SAL SU SAC	4	SIMMONS MS	4	ST ANSELM	4
ROCKHURST	4	SALEM MASS	4	SIMPSON IA	5	ST ANSELMS	4
ROCKMONT	4	SALEM WVA	5	SKIDMORE	3	ST ANTH NH	4
ROCKY MNTN	4	SALISBURY	4	SLIPPERY R	5	ST AUGUSTI	5
ROLLINS	3	SALVE REGI	5	SMITH	2	ST BEN KAN	4
ROOSVLT IL	4	SAMFORD U	4	SMITH MA	2	ST BEN MN	3
ROSARY ILL	4	SANFORD U	1	SMITH MASS	2	ST BENDT	3
ROSE-HULM	2	SANGAMN SU	7	SMU	3	ST BERNADN	3
ROSE-HULMN	2	SANTA CLRA	4	SNA	1	ST BONAUEN	4
ROSE HULMN	2	SANTA FE	6	SNTO TOMAS	7	ST BONAVEN	4
RUST MISS	5	SAV ART D	7	SO ARK U	6	ST BRND AL	7
RUTGERS	2	SAVANNAH	5	SO BENDCTN	7	ST CATH MN	4
RUTGERS SC	2	SC ARKANS	6	SO CALIF	3	ST CLD MIN	4
S CAROL SC	5	SC ARKANSA	6	SO COL SC	5	ST CLOUD	4
S CAROL SU	5	SC STATE	5	SO CONN SC	4	ST EDW TEX	4
S DAK MINE	3	SCHILR GRM	7	SO CONN SU	4	ST F X CAN	7
S DAK NINE	3	SCHREINER	5	SO ILLINIO	4	ST FRNC IL	3
S DAKOT SU	4	SCRD HT CN	4	SO ILLINO	4	ST FRNC NY	3
S DIEGO	4	SCRD HT CT	4	SO ILLINOI	4	ST FRNC PA	3
S DIEGO SC	4	SCRD HT PR	5	SO ILLIONI	4	ST FRNCS S	5

ST J FISHE	4	ST PROCOPI	4	SWARTHMORE	1	TRANSYLVAN	4
ST J FISHR	4	ST ROSE	4	SWATHMORE	1	TRENTON NJ	3
ST JHN CAL	7	ST SCHOLAS	4	SWEETBRIAR	4	TRENTON SC	3
ST JHN MD	3	ST THOM MN	7	SWESTRN KN	4	TREVECCA	5
ST JHN MIN	3	ST THOS CO	7	SWSTRN CAL	5	TRI STATE	4
ST JHN NY	4	ST THOS MN	5	SYRACUSE	3	TRI STATTE	4
ST JOHN MD	4	ST THOS NY	5	SYRACUSE U	3	TRINITY CH	6
ST JOHN NY	4	ST THOS PL	5	T AQUINAS	2	TRINITY CN	3
ST JOS CON	4	ST UNIN NY	4	T EDISON C	6	TRINITY CT	4
ST JOS ILL	4	ST UNIV	3	T MORE KY	4	TRINITY DC	5
ST JOS IND	4	ST UNIV NY	3	TABOR KAN	4	TRINITY IL	3
ST JOS ME	4	ST UNIVNY	4	TALLADEGA	5	TRINITY TX	3
ST JOS NY	4	ST VINCENT	4	TAMPA C FL	4	TROY	4
ST JOS PA	4	ST XAVIER	4	TARKIO MO	4	TROY ALA	5
ST JSPH C	4	STANFORD	1	TAYLOR IND	4	TROY SO	4
ST LAWR NY	3	STANFORD U	1	TCU	3	TROY SU	4
ST LEO	4	STANISLAUS	4	TEEN TECH	4	TUFTS	1
ST LEO FL	4	STEPHENS	5	TEMPLE PA	4	TULANE	2
ST LEO FLA	4	STETSON	3	TENN SU	4	TUSCULUM	5
ST LOIS U	4	STEUBENVIL	4	TENN TECH	4	TUSKEGEE	5
ST LOUIS C	7	STEVENS NJ	3	TENN TEMP	4	TW CONN SC	7
ST LOUIS P	4	STEVENS PT	2	TENN TEMPL	7	U IOWA	3
ST LOUIS U	4	STILLMAN	4	TENN WESLY	4	U AKRON	5
ST MARTIN	4	STOCKTON	4	TENNESSE	4	U AKRORON	5
ST MARTINS	4	STOCTON	4	TEX A & I	5	U ALABAMA	4
ST MARY MD	4	STONEHILL	4	TEX A&I	5	U ALASKA	5
ST MEINARD	7	STRAYER DC	6	TEX A&I U	5	U ARIZONA	4
ST MEINRAD	7	SUFFOLK MA	5	TEX A&M	3	U ARIZONIA	4
ST MICH VT	4	SUFFOLK MS	5	TEXAS A&I	5	U ARKANSAS	5
ST MRY CAL	4	SUNA	1	TEXAS A&M	3	U ARKON	5
ST MRY COL	4	SUSQUEHANN	5	TEXAS A/M	3	U BAGUIO	7
ST MRY IND	4	SW ASSEMBL	7	TEXAS A3M	3	U BALTIMOR	4
ST MRY KAN	4	SW BAPT MO	4	TEXAS AFM	3	U BRIDGEPO	4
ST MRY LAK	4	SW BAPTIST	4	TEXAS AM	3	U CALGARY	7
ST MRY MCH	4	SW MEMPHIS	3	TEXAS C	5	U CALIF	3
ST MRY MD	4	SW MINN SO	5	TEXAS LUTH	4	U CALIFORN	3
ST MRY MIN	4	SW MISSOUR	5	TEXAS SO U	6	U CAMBRIDG	7
ST MRY MN	4	SW MO SU	5	TEXAS TECH	5	U CHARLEST	4
ST MRY PLN	4	SW OKLA SU	5	TEXAS WES	5	U CHICAGO	1
ST MRY PR	4	SW SC OKLA	5	TEXAS WOMN	5	U CINCINNA	4
ST MRY TEX	4	SW SU MINN	5	THIEL PA	4	U CINNINNA	4
ST MRY WD	4	SW TEX SU	4	THOMAS ME	4	U CNTL ARK	4
ST NORBERT	3	SW TEXAS	4	TOUGALOO	4	U CNTL FL	4
ST OLAF MN	3	SW TEXAS S	4	TOWNSON MD	4	U CNTL FLA	4
ST PAUL B	5	SW U CAL	4	TOWSON MD	4	U COLORADA	3
ST PETERS	5	SW U TEX	4	TOWSON SU	4	U COLORADO	3

U CONNECTI	3	U MIAMI	3	U PITTSBUR	4	U WINCONSI	3
U DAK MINE	3	U MIAMI FL	3	U PORTLAND	4	U WINDSOR	7
U DALLAS	3	U MICHICAN	3	U PUERTO	4	U WISCONSI	3
U DAYTON	4	U MICHIGAN	3	U PUERTO R	4	U WYOMING	6
U DELAEARE	3	U MINESOT	3	U PUGET SO	3	UANA	1
U DELAWARE	3	U MINN	3	U REDLANDS	3	UARKANSAS	5
U DENVER	3	U MINNESOT	3	U RHODE IS	4	UCLA	3
U DET MRCY	3	U MINNRSOT	3	U RICHMOND	3	UDC DC	6
U DETROIT	3	U MISSIPPI	4	U ROCHESTE	2	UN CAROLI	4
U DUBLIN	7	U MISSOURI	4	U ROCHSTE	2	UNION NY	2
U DUBUQUE	4	U MISSSOU	4	U S ALABAM	4	UNION C NY	2
U EAST	7	U MNTEVALO	4	U S CALOLI	4	UNION C&U	4
U EVANSVIL	4	U MONTANA	6	U S CAROLI	4	UNION CSU	2
U FLORDIA	3	U MRYLAND	4	U S CLARA	3	UNION KY	5
U FLORIDA	3	U N ALABAM	6	U S COLORA	4	UNION NEBR	5
U FLORODA	3	U N CAROLI	3	U S DAKOTA	5	UNION NY	2
U GEORGIA	4	U N COLORA	4	U S DIEGO	4	UNION TENN	4
U GUAM	6	U N DAKOTA	6	U S FLORID	3	UNITY ME	5
U HARTFORD	4	U N FLORID	3	U S FRORID	3	UNIV ST NY	4
U HAWAII	5	U N IOWA	4	U SAN FRAN	4	UPI & SU	3
U HLTH OST	7	U NEB KRNY	4	U SCRANTON	3	UPPER IOWA	4
U HLTH SCI	7	U NEB OMHA	6	U SO CALIF	3	UPSALA NJ	5
U HOUSTON	5	U NEBRASKA	6	U SO IND	6	URSINUS	3
U IDADHO	6	U NEVADA	4	U SOUTH TN	2	URSINUS PA	3
U IDAHO	6	U NEW ENG	4	U ST ANDRW	4	URSULINE	4
U ILLINOI	4	U NEW HAMP	3	U ST THOMA	3	URSULINE O	4
U ILLINOIS	4	U NEW HAVN	4	U SW LA	5	US FLORID	3
U ILLIONIS	4	U NEW MEXI	4	U TAMPA	4	US ALABAM	4
U ILLNOIS	4	U NEWHAMP	3	U TENN HSP	7	US CAROLI	4
U IOWA	3	U NEWMEXI	4	U TENNESEE	4	USAF	1
U ITAH	4	U NORT FL	4	U TENNESSE	4	USAFA	1
U IWOWA	3	U NORTH FL	4	U TEXAS	3	USIU	3
U KANSAS	6	U NORTH TX	4	U TOLEDO	5	USMA	1
U KENTUCKY	4	U OKALHOMA	4	U TORONTO	7	USMMA	1
U LIVRPOOL	7	U OKLAHOM	4	U TULSA	4	USN	1
U LONDON	7	U OKLAHOMA	4	U UTAH	4	USNA	1
U LOUISVIL	4	U OREGON	4	U VERMONT	3	USSMA	1
U LOWELL	3	U OZARKS	4	U VIEGINIA	2	USURLINE O	4
U MADRAS	7	U PAC CAL	4	U VIRGINA	2	UTAH SU	5
U MAIMI FL	3	U PENN	1	U VIRGINIA	2	UY TAMPA	4
U MAINE	5	U PENNSLYV	1	U VIRGN IS	7	V MARIA	4
U MANITOBA	7	U PENNSYL	1	U WASHIGT	3	VA CMN MED	4
U MARY ND	4	U PENNSYLV	1	U WASHING	3	VA CMNWLTH	4
U MARYLAND	6	U PHILIPPI	7	U WASHINGT	3	VA WESLYN	4
U MASSACHU	4	U PHILLIPP	7	U WEST FL	3	VALDOSTA	5
U MEMPHIS	4	U PHOENIX	4	U WEST FLA	3	VALLEY CTY	6

VALPROSO U	3	W PATTERSO	4	WEBB NY	1	WILSON PA	4
VALPRSO U	3	W PENN IA	5	WEBER UTAH	6	WINDHAM VT	3
VANDERBILT	2	W SUBURBAN	7	WEBSTER MO	4	WINGATE	5
VASSAR	2	W TEXAS SU	5	WELLESLEY	1	WINONA MN	5
VILANOVA	3	W VA STATE	5	WELLS C NY	4	WINONA SU	5
VILLANOA	3	W VA TECH	4	WENTWORT	5	WINSTON SA	5
VILLANOVA	3	W VA WESLY	4	WENTWTH MS	5	WINTHROP	5
VILLAVA	3	W WASHINGT	3	WESLEY DEL	4	WITTENBERG	4
VILLINOVA	3	W WILSON	4	WESLYN CON	2	WITTENBURG	4
VIRGINA UN	2	W WOODS MO	4	WESLYN GA	4	WM & MARY	2
VIRGINIA S	5	WABASH	4	WESTFIELD	4	WM&MARY	2
VITERBO WI	4	WABASH IND	4	WESTMAR IA	4	WOFFORD SC	3
VITERBO WS	4	WAGNER NY	4	WESTMNSTR	4	WOOSTER OH	3
VMI	4	WAKE FORES	2	WESTMONT	4	WORCESTER	2
VPI	3	WALLA C WA	4	WESTRN COL	4	WORCESTR	2
VPI & SU	3	WALLA WALL	4	WETMSTR TH	7	WORCESTR P	2
VPI SU	3	WALSH C OH	4	WHEATON IL	4	WRIGHT SU	6
VPI&SU	3	WARNER PAC	5	WHEATON MS	4	WSTMSTR MO	4
W BAPTIST	7	WARTBURG	4	WHEELING	4	WSTMSTR PA	4
W CAREY	4	WARTBURG C	4	WHEELOCK	5	WSTMSTR UT	4
W CAROLINA	5	WASGTN SU	4	WHITEWATER	5	WSTRN NMEX	5
W CHESTER	4	WASH & LEE	2	WHITMAN	3	WVA	5
W CONN SC	4	WASH BIBLE	7	WHITTER	3	WVU	4
W CONN SU	4	WASH SU	4	WHITTIER	3	X PC U COL	4
W GEORGIA	5	WASH&JEFF	3	WHITWORTH	4	XAVIER	5
W ILLINOI	5	WASH&LEE	2	WICHITA SU	4	XAVIER LA	5
W ILLINOIS	5	WASHBURN	6	WIDENER PA	3	XAVIER OH	5
W JEWELL	4	WASHGTN MD	4	WILBERFORC	4	YALE	1
W KENTUCKY	5	WASHGTN MO	4	WILKES PA	4	YANKTON	5
W LIBERTY	5	WASHGTN SU	4	WILKS PA	4	YORK CAN	7
W MARYLAND	4	WAYLAND TX	5	WILLAMETTE	3	YORK PA	4
W MICHIGAN	4	WAYNE MICH	4	WILLIAMS	1	YOUNGSTOWN	6
W NEW ENG	4	WAYNE NEBR	4	WILMGTN DE	4		
W OREGON	4	WAYNE SU	4	WILMGTN NC	4		
W PATERSON	4	WAYNESBURG	4	WILMGTN OH	4		

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